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## Chapter VI

★

RESOURCES AND TRADE

OF

# BULGARIA

(JANIS No. 38)

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## Chapter VI

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### RESOURCES AND TRADE

#### 60. General Description

##### A. Commerce.

Bulgaria's foreign trade is now almost entirely with Germany. Before Italy was cut off and surrendered, it received about nine per cent of Bulgaria's exports. Agricultural products, which are Bulgaria's principal export, have been increased since 1941, despite bad harvests. In the same period, imports have increased very little; these consisted mostly of industrial products, in which the country is almost entirely deficient.

As the prices of imported products have risen, exports have been taxed to subsidize imports. The balance of trade with Germany cannot be considered favorable to Bulgaria because Bulgaria receives from Germany only paper credit in return for many of her exported goods.

##### B. Finance.

Among the Bulgarian peasantry, comprising 80 per cent of the population, trade is normally carried on by small-scale barter and by credit at the cooperative stores.

Since 1939, currency has been inflated more than 400 per cent and commodity prices have been doubled. Domestic banking is dominated by the Bulgarian Government through its own banking institutions. However, Germany controls Bulgarian foreign exchange through the Berlin clearing system, using this as a means of confining Bulgarian foreign trade to Germany.

##### C. Industrial raw materials and primary processing.

(1) *Minerals.* Although several types of ore deposits are mined in Bulgaria, an interruption in the ore shipment to Germany would not seriously impair the Axis war economy. Iron ore, chrome, and manganese are the important minerals, while copper, lead, and zinc are mined in smaller quantities. The lack of equipment, remoteness, and the relatively long distances to smelting and refining plants have hampered the development of mineral resources in the country.

##### (2) Fuel.

(a) *Coal.* Sufficient coal is mined in the country to supply normal domestic requirements. The mines at Pernik\* account for 85 to 90 per cent of the total output. Current coal shortages reflect abnormal war-time demands and transportation difficulties.

(b) *Wood.* Firewood and charcoal, of which Bulgaria has an ample supply, are the principal fuels for domestic use.

(c) *Petroleum.* Storage is available for about 100,000 tons of oil, chiefly concentrated at Ruse, Burgaz and Varna.

\*The following spellings of features as used in this Chapter differ slightly from those on G.S., G.S. maps, Series 4072 and 4088: Bebrezh, Bozhurishte, Canara (Kana-Gol), Carasuum, Cherni Iskr, Chiporovtsi, Devna, Dobrich (Bazargic), Dobrinishta, Dubovo, Ellidere, Emine (town), Ghiaur Suiuciuc (Chiaur Suiuciuc), Gorna Dzhumaya, Gorna Orekhovitsa (Gln.-Orekhovitsa), Gulubovo (Gara-Glebovo), Kazanik, Kharmanli, Koprivshitsa, Kuri Burnu, Ladhene (Lzhene), Musala, Panagyurishte, Paphia (Mt.), Peinirdzhik, Perushitsa, Peshtera, Piraiévs, Pirdop (Pirdol), Polikraishte, Rakovets, Resen (Pesen), Sofiya, Sredets, Stizharov, Surnena Gora (Srneha Gora), Svishtov, Syuyutiika, and Trgovishte.

(3) *Forests.* Although nearly one-third of Bulgaria is covered with broadleaf and coniferous forests, lack of adequate facilities (sawmills, pulp mills and railroads in the forest areas) have kept domestic output of some forest products below requirements. Cellulose is the principal forest product import.

##### D. Electric power.

Adequate electric power has been developed in only two areas: Sofiya and Plovdiv/Pazardzhik. The Stara-Zagora area is becoming increasingly well served. Ninety per cent of the installed generating capacity is divided almost equally between hydroelectric and steam installations, with the remainder made up of a large number of small Diesel plants. Total electric power production in 1941 amounted to 303.2 million kwh. The most important hydroelectric plants are at Krichim (Vucha), Boyana, Mala-Tsrkva, Pančarevo, Pastra, and Rila. The most important steam plants are Pernik, Maritsa and Kurilo.

##### E. Manufacturing.

(1) *Metals.* Bulgaria depends almost entirely on the import of semi-finished and finished metals for its metal supply. Simple tools, parts and utensils are made in the country, but equipment for producing complicated machine parts is lacking. There are assembly and repair facilities for artillery, small arms and airplanes, but even these are limited. Ammunition is produced in moderate quantities.

(2) *Chemicals.* The country is largely dependent on imports for basic chemicals, as for several other types of manufactures. Local production of soap, glycerin, alcohol and matches equals or nearly equals domestic needs.

(3) *Other goods.* Domestic production of leather and rubber, and their products, falls far short of local needs. However, the country is normally self-sufficient in all branches of the textile industry. Simple processed building materials are normally produced in adequate quantities. The current shortage of cement reflects abnormal war-time demands.

##### F. Food resources.

(1) *Farming.* Bulgaria is predominantly an agricultural country, with about 30 per cent of its area under cultivation. Farms are small and are worked with few and outmoded implements. The country is about 90 per cent self-sufficient in foodstuffs. Except for crop failures, an exportable surplus is produced of wheat and other cereals, poultry, eggs, fruit (especially table grapes), vegetable oils, potatoes, mutton, and industrial products including opium, leaf tobacco, silk, hemp and flax. Food rationing has been introduced in Bulgarian cities, which are experiencing a definite food shortage.

(2) *Fishing.* The fishing industry is concentrated in a narrow zone along the Black Sea coast, and on the Danube River and its overflow channels. The fishermen operate on a small scale with primitive equipment, while modern fish-processing is only slightly developed. Normally, Bulgaria imported a quantity of fish equal to one-half to two-thirds of

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her own production. The war seemingly has not adversely affected fish production in Bulgaria.

(3) *Food processing.* Commercial food processing plants are relatively few and small, as their market is largely confined to the urban population. The rural peasants do most of their own simple processing of foodstuffs. Among the more important urban processing plants are: flour mills, vegetable oil factories, distilleries, breweries and wineries, sugar refineries, and fruit- and vegetable-preserving plants. The last group has recently been augmented to meet increased German demands. The leading food processing centers are the country's six largest cities: Burgaz, Pleven, Plovdiv, Ruse, Sofiya and Varna.

#### G. Water supply.

Forces of occupation would ordinarily find adequate supplies of water, except in parts of northern and eastern Bulgaria. Summer is the season of least abundant water. Because of widespread pollution, the treatment of water is always advisable.

The uplands and the Maritsa Valley have numerous perennial streams, shallow wells in alluvial areas, and springs. In the northern plateaus water is far below the surface, except in the valleys where there are shallow wells and springs. The Burgaz area suffers from water scarcity, except near the coast where there are large wells.

Nearly half the population of Bulgaria depends on water taken directly from wells, springs and rivers. Water is piped into almost all cities, though not into the majority of residences, and public fountains are widely used. Several towns are supplied by long aqueducts from mountain sources. Sofiya and Burgaz have vulnerable water supply lines (Illustrations VI - 15 and VI - 16). Sofiya has an alternate source that could meet minimum needs. The water of the Sofiya area is soft, but in most of Bulgaria it is hard.

### 61. Commerce

Since Bulgaria is primarily an agricultural country, it imports virtually all industrial products, which are exchanged for exports of surplus agricultural products (Table VI - 1).

TABLE VI - 1  
BULGARIA, FOREIGN TRADE

	(In Metric Tons)	
	IMPORTS	EXPORTS
1940.....	382,700	995,804
1941.....	458,700	459,500
1942.....	469,900	680,740

	(In Millions of Leva)	
	IMPORTS	EXPORTS
1940.....	7,028	7,019
1941.....	10,239	9,234
1942.....	12,930	13,420

In terms of tonnage, both imports and exports have been increased considerably during the war, due, in part, to the annexation of territories.

#### A. Export tonnage.

In every year Bulgaria has exported more tonnage than was imported, despite the fact that a severe drop in export tonnage occurred in 1941. This drop was due to bad grain

harvest, transportation difficulties, and other disruptions caused by the war. It is believed that export tonnage for the first eight months of 1943 was slightly greater than for the comparable period in 1942. The results for 1943 as a whole will depend on the outcome of the fall harvests and the reaction of the Bulgarians towards compulsory delivery to the Germans. On the other hand, imports are said to have suffered from the failure of Germany to meet schedules as promised.

In terms of value, Bulgaria's trade, which showed an export surplus of 868 million *leva* in 1939 and an approximate balance in 1940, was characterized by an import surplus in 1941, amounting to 1,005 million *leva* (Table VI - 1). However, this reversal was only temporary, caused by the severe drop in exports to non-Axis countries that year and by a rapid growth in imports of war materials, including machinery and supplies for the army.

The value of exports did not decline as much as their volume in 1941, but this was due in part to higher prices and in part to a change in composition. Bulk cereals, foodstuffs, fresh fruits, and vegetables were partially supplanted by quality foodstuffs of higher value and less bulk, such as dried products, jams, and fruit pulp. In 1942, a small export surplus was regained and the quantity of higher-value foodstuffs continued to increase.

In terms of 1941 tonnage, the most important exports were, in order: grain, fruit, oilseeds, lignite, and tobacco. In terms of value, the order was tobacco, fruit, eggs, and oilseeds. Other export items were poultry, meat, wine, rice, some leather and hides, perfumes, medicinal herbs, and small quantities of metals and ores. The chief imported products were: metal and metal products, machinery, armaments, textiles, rolling stock, and automobiles.

Bulgaria's exports to Germany ranged from 59 per cent of the total exports in 1940 to 70 per cent in 1941, and to about 90 per cent in 1942. Of the rest, the largest amount went to Italy (8.5 per cent in 1941), and the remainder to other European countries. Bulgarian foreign trade is now almost exclusively dependent on Germany and, until very recently, Italy.

Bulgaria's trade agreement with Germany from October 1942 to March 1943 included the export of tobacco, eggs, corn, wine, fresh meat, fruit pulp, and the import of machines, chemicals (especially quinine), rye, and saccharine.

#### B. Import tonnage.

Bulgaria was importing textiles from Italy (the principal source) under the trade agreement of 1943. In 1941 these imports amounted to 1,062 tons, valued at \$2,382,700. Other imports from Italy comprised tanning materials and paints, machinery, instruments, sugar, rolling stock, chemicals, metals and metal products, wood articles, raw materials for the paper industry, stone and clay, and medicinals. Bulgarian exports to Italy consisted of animal food products, tobacco, oilseeds, waste products, textile fibers, skins and hides, fruits and vegetables, metal products, fuels, and livestock.

Foreign trade is now strictly controlled by the Foreign Trade Office and by the National Bank. One of the main difficulties has been the control of prices. To offset the rise in the price of imports, exports have been taxed and the revenue used to subsidize imports.

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## 62. Finance

### A. Currency.

(1) *Coinage*. The basic unit of the Bulgarian monetary system is the *lev* (plural *leva*), divided into 100 *stotinki*. The denominations of the coinage are shown in Table VI - 2.

TABLE VI - 2  
BULGARIA, DENOMINATIONS OF COINAGE

50 <i>stotinki</i> .....	91% copper, 9% aluminum
1, 2, 5 and 10 <i>leva</i> .....	75% copper, 25% nickel
20, 50, and 100 <i>leva</i> ...	50% silver, 40% copper, 5% nickel, 5% zinc

In December 1939, 1,452 million *leva* in these denominations were outstanding, a very low per capita circulation. Since then, because of the tremendous expansion of total money in circulation, about 1,800 million more *leva* in coins have been authorized (Table VI - 3). The new 20- and 50-*leva* pieces are to be made of copper and nickel; the 2-*leva* pieces, of iron.

(2) *Bank notes*. Issuance of bank notes is a monopoly of the National Bank, these notes being legal tender to any amount. Apparently, by December 1939, they had been issued only in denominations of 500, 1,000, and 5,000 *leva*, printed in London in 1925 and 1929. The 1929 printing included notes of 200, 250, and 5,000 *leva*, which had not been put into use by 1939.

Between December 1939 and December 1942, bank-note circulation increased more than four times to 18,922 million *leva*, necessitating additional series and denominations (Table VI - 4). The main factors accounting for this rise were hoard-

TABLE VI - 3  
BULGARIA, CIRCULATION OF SUBSIDIARY COINS  
In Circulation, December, 1939

DENOMINATION	TOTAL VALUE MILLIONS OF LEVA
50 <i>stotinki</i> .....	19
1 <i>lev</i> .....	42
2 <i>leva</i> .....	43
5 <i>leva</i> .....	55
10 <i>leva</i> .....	93
20 <i>leva</i> .....	176
50 <i>leva</i> .....	518
100 <i>leva</i> .....	506
Total.....	1,452
AUTHORIZED, OCTOBER 1940	
20 <i>leva</i> .....	133
50 <i>leva</i> .....	667
Total.....	800
AUTHORIZED, SPRING 1943	
2 <i>leva</i> .....	70
5 <i>leva</i> .....	180
10 <i>leva</i> .....	250
50 <i>leva</i> .....	500
Total.....	1,000

TABLE VI - 4  
BULGARIA, BANK NOTES IN CIRCULATION

DEC. 31	VALUE
1938.....	3,801
1939.....	4,245
1940.....	6,518
1941.....	13,467
1942.....	18,922

ing of currency, induced by fear of further price inflation and distrust of state financial measures, and the larger volume of business at higher prices.

(3) *Certificates*. The Treasury has also issued 3 per cent one- and two-year certificates to cover its extraordinary expenditures. Since they are issued in large denominations, as well as in 1,000- and 5,000-*leva* values for which bank notes exist, they apparently obviate the larger-scale issuance of bank notes in time of inflation. By April 1943, it was reported that 2,300 million *leva* in these certificates had been sold.

In May 1943, the National Bank decreed their compulsory acceptance in payment of liabilities at full nominal value, plus accumulated interest. Moreover, all banks and credit institutions were required to disburse these notes for all but small payments, salaries and wages.

In June 1943, the National Bank announced that all holdings of 500- and 1,000-*leva* bank notes must be exchanged before September 20 for Treasury certificates (40 per cent) and 500-*leva* notes (60 per cent).

(4) *Checks*. The use of checks as a means of payment has had very limited development in Bulgaria, although the Post Office now provides a checking service. In rural districts among the peasantry, comprising 80 per cent of the population, even cash is little used except at harvest time. Normally, a substantial trade is carried on by small-scale barter and through credit extended by the cooperatives' stores.

### B. Purchasing power.

Between December 1939 and December 1943, the real value of the *lev* was decreased one-half as a result of the doubling in prices of commodities (Table VI - 5). Wages and salaries

TABLE VI - 5  
BULGARIAN COMMODITY PRICES

	Monthly Averages, 1939=100	
	WHOLESALE PRICE	COST OF LIVING
December 1939.....	104.4	101.4
1940.....	135.2	120.3
1941.....	167.4	160.0
1942.....	199.9	195.7

have been raised several times, but the greater rise in the cost of living has caused real earnings to decline. Agricultural producers have been favored more than any other economic group by price-supporting measures and by increased exports to Germany. The growing scarcity of consumer goods, together with a rising supply of money, has exercised great pressure on the price structure and facilitated development of black markets. Early in 1943 prices in the black markets were said to be two to five times higher than those fixed by the government. Real estate prices had advanced 300 to 400 per cent above 1939 levels.

### C. Currency value in gold.

The devaluation of the dollar with respect to gold in 1933-34 reduced the gold parity from 138 *leva* per dollar (\$0.0072) to 84 *leva* per dollar (\$0.0122 per *lev*). However, since free interchange no longer exists, the practical relation of the *lev* to gold has been destroyed.

Prices for United States gold coins in the Bulgarian black market are said to have exceeded 1100 *leva* per dollar.

The National Bank has contracted the entire domestic

output of gold, the sole important source being the Anglo-Bulgarian Mining Company at Trn, where annual production amounted to about 250 kilograms.

#### D. The banking system.

Bulgarian banking is dominated by the government; since the war private financial interests have been further restricted. As in all other countries during the war, the banks have experienced a tremendous inflation of both assets and liabilities. However, the doubling of deposits was due to increased loans and investments (mainly government obligations), rather than to any increase in real savings. Descriptions of the important banking institutions in Bulgaria follow.

(1) *The National Bank of Bulgaria (Bulgarska Narodna Banka)*. This central bank, wholly owned by the State, is the only bank which issues circulating notes. It also rediscounts for other banks, serves as a creditor, fiscal agent, and depository of the State and other public bodies, and controls the foreign exchange and gold markets. In 1939 it possessed 23 branches, and in smaller towns 75 agencies which served as paying and receiving cashiers mainly for the government.

(2) *The Agricultural and Cooperative Bank (Zemedska Kooperativna Banka)*. This bank, with 173 branches, also is owned wholly by the State. It lends money against real estate, government securities and the guarantee of public administrative bodies. It participates in state loans, supports agricultural prices, and finances the purchase of agricultural equipment. The bulk of its deposits includes funds of the Postal-Savings Office and other public institutions and cooperatives.

(3) *Agricultural credit cooperatives*. In 1939 there were 1,726 credit cooperatives, closely controlled in conduct, organization and membership by the Agricultural and Cooperative Bank. In 1938 their membership totalled 167,458 persons.

(4) *People's banks*. These banks, similar to the rural credit cooperatives and organized in the same way, operate either individually or in groups under the central Agricultural and Cooperative Bank, although they are not so closely controlled by it. In 1939, there were 310 People's Banks, with a membership of mostly handicraft workers, wage earners, small income employees and some farmers (totaling 242,187 members in 1938).

(5) *The Postal-Savings System*. In 1939 there were 749 postal-savings offices in Bulgaria. In May 1943 there were 828,564 depositors, over 97 per cent of whom were individuals.

The checking service (*Postcheckkonto*), although limited, has expanded rapidly.

(6) *The Mortgage Bank (Bulgarska Hipotekarna Banka)*. This institution, which was created to take over the mortgage business of the National Bank and is now controlled by the Agricultural and Cooperative Bank, makes loans primarily against urban property.

(7) *The Credit Bulgare (Bulgarska Kreditna Banka)*. Controlled by the government, this bank has a special status in the financing of municipalities and in the State's commercial banking operations.

(8) *The German-Bulgarian Credit Bank*. This bank has shown a very rapid growth by virtue of its advantage in financing the greatly increased trade with Germany. It has

been entrusted with special transactions, e.g., the remittance of wages to Bulgarian workers in Germany.

(9) *Private commercial banks*. The important commercial banks, with headquarters in Sofiya and branches in the larger towns, together with smaller provincial banks of local character, serve merchants and businessmen rather than persons of small means, who deal with the cooperatives and the People's banks. The private banks are regulated by the Finance Minister through a Bank Council.

(10) *Clearing house*. The leading Bulgarian financial institutions belong to the Sofiya Clearing House (Table VI - 6). Included among the commercial banks are several under foreign control: the German-Bulgarian Credit Bank (*Deutsche-Bulgarische Kreditbank*), the Italian-Bulgarian Commercial Bank (*Banca Commerciale Italiana e Bulgara*) and (as of 1939) the Anglo-Prague Credit Bank and the Franco-Bulgarian Bank.

TABLE VI - 6  
SOFIYA, TURNOVER AT CLEARING HOUSE, 1939

	IN MILLIONS OF LEVA
National Bank.....	11,761
Kreditbank (now Deutsche-Bulgarische Kreditbank).....	6,351
Banque Credit Bulgare.....	5,082
Agricultural and Cooperative Bank.....	4,638
Post Office Check Service.....	3,550
Banca Commerciale Italiana e Bulgara.....	1,280
Union of Popular Banks.....	881
Bulgarian Bank of Commerce.....	643
Anglo-Prague Credit Bank.....	533
Franco-Bulgarian Bank.....	388
Total.....	35,107

(11) *Foreign exchange*. Before the war, the Bulgarian Government controlled its own foreign exchange market. But as early as 1940 Bulgaria was obliged to settle her trade with Germany and other European nations through the Berlin clearing system. This finally resulted in virtual German control and facilitated an enlargement of Bulgarian trade with Germany.

Since exports to Germany exceed imports from that country, the clearing system has become essentially a means by which Bulgaria extends credits to Germany. By the middle of 1943, Bulgaria's clearing claims on Germany probably amounted to 18,000 million *leva*.

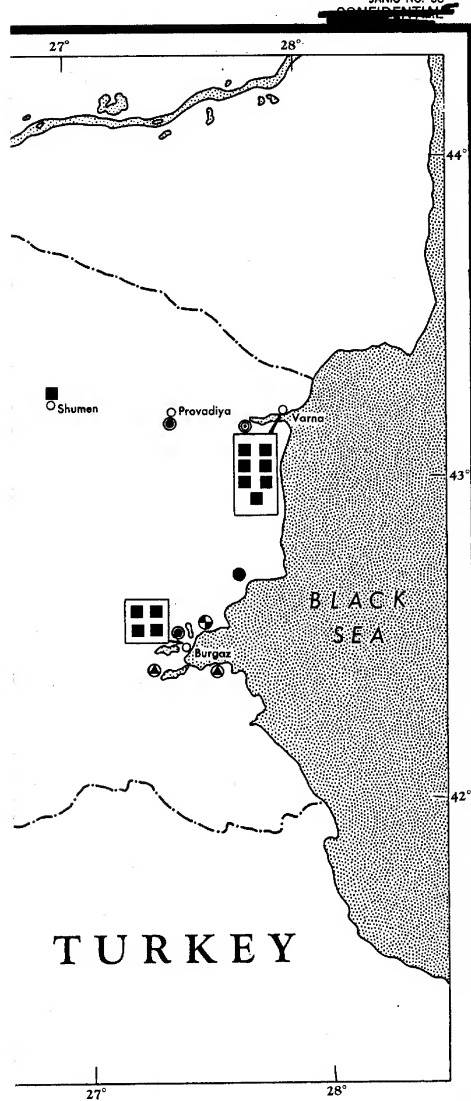
Although the basic clearing rate against the *reichsmark* (RM) remains unchanged, 33 *leva* per RM, it hardly measures the relative worth of the two currencies in view of the huge clearing claims against Germany.

On the balance sheet of the National Bank, these claims are the main asset to counterbalance the enormous issue of new bank notes. In other words, by these means the real goods of Bulgaria are drawn off to Germany at the same time Bulgaria is flooded with currency.

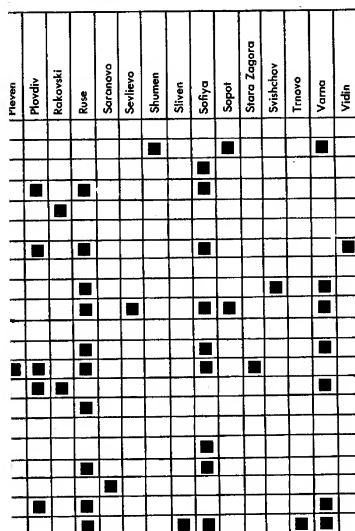
## 63. Industrial Raw Materials and Primary Processing

### A. Minerals.

(1) *Iron ore*. (Figure VI-1.) It is believed that about 30,000 MT (metric tons) iron ore are mined annually in Bulgaria. The best-known mine is the Blagovest (Table VI - 7).

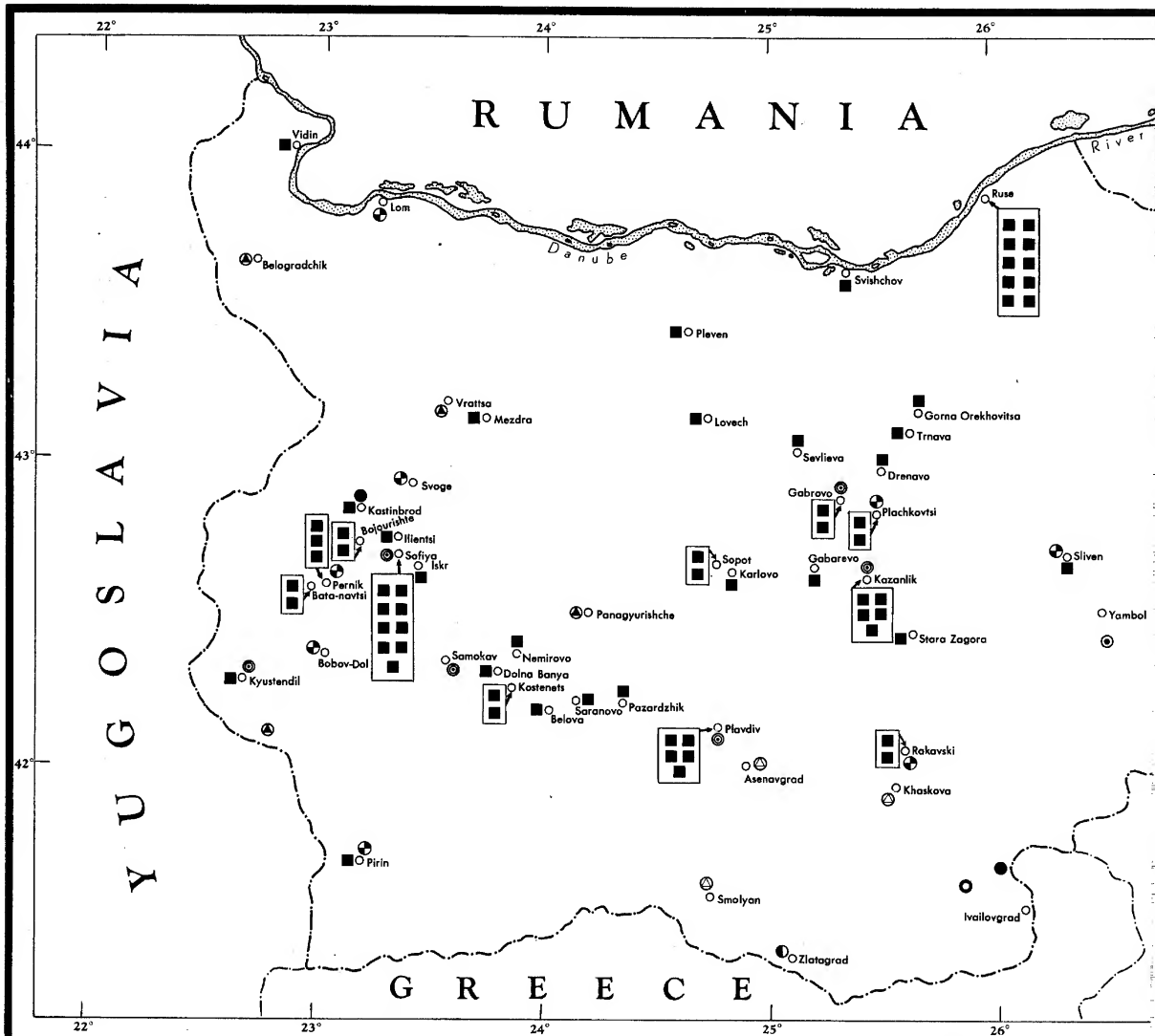


## FACILITIES





PROVISIONAL EDITION

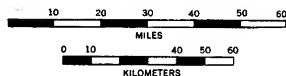


## BULGARIA: RESOURCES AND INDUSTRIAL

■ INDICATES ONE INDUSTRIAL FACILITY

### MINERAL RESOURCES

- Mica
- ⊕ Coal and Lignite
- ⊙ Stone
- ⊙ Salt
- ⊙ Iron Ore
- ⊙ Chromite
- Manganese
- ⊙ Copper
- ⊙ Lead and Zinc



Reliability Code 2B-1B-2

	Bela-Navitsa	Belovo	Bojursk	Burgas	Drenava	Dolna Banya	Gabarevo	Gorna Orekhovitsa	Iltis	Karlova	Kazanlik	Kostenets	Kastinbrad	Kyustendil	Lovech	Mezdra	Nemirova	Pazardzhik	Pernik	Pirin	Plachkovtsi
Aircraft Assembly and Repair Plant																					
Ammunition Plant																					
Armament Plant																					
Brick Plant																					
Briquette Plant																					
Cement Plant																					
Chemical Plant																					
Coke Ovens																					
Commercial Oil Storage Area																					
Explosives Plant																					
Glass Plant																					
Leather Goods Plant																					
Metalworking Plant																					
Military Oil Storage																					
Oil Refinery																					
Paper Mill																					
Pharmaceutical Plant																					
Rubber Factory																					
Sawmills																					
Soap Factory																					
Textile Plant																					

The extent to which other deposits are worked is unknown (such as those near Kremikovtsi, Gradets, Troyan, Krumovo, etc.). Although some of the ores are rich according to European standards, Bulgarian iron ore production is small. All iron ore is exported, particularly to Hungary, for smelting.

TABLE VI - 7  
BULGARIA, IRON MINES

LOCATION	PRODUCTION
Blagovest mine, near Gol. Mnastir 20 km. (12 mi.) SE of Yambol	Reserves: Estimated as high as 500,000 MT of 60 to 65% Fe magnetite (low phosphorus and sulfur). Production: 1936: 6,000 MT; 1937: 12,000 MT; 1941: 25,000 MT (estimated).

(2) *Chromite*. Bulgaria is estimated to furnish at present 5,000 MT of metallurgical chromite and 5,000 MT of refractory chromite to Axis economy. Transportation difficulties have prevented an earlier expansion. Although this supply is not of primary importance to Germany, it represents 15 per cent of Germany's chromite imports for metallurgical purposes. The location and reserves of Bulgarian chromite mines are shown in Table VI - 8.

TABLE VI - 8  
BULGARIA, CHROMITE MINES

LOCATION	RESERVES	FACILITIES	REMARKS
Near Zlatograd Drenkoff mine	50,000 MT	Surface mines	Handpicked for upgrading; shipped to Momchilgrad railroad station.

(3) *Manganese ore*. The two most important Bulgarian manganese deposits are near Kostinbrod and Bela (Table VI - 9). 1942 production has been estimated as high as 40,000 MT of ore with 14,000 MT of manganese content. Bulgarian manganese ore would become important to Germany if it lost access to Ukrainian ores.

TABLE VI - 9  
BULGARIA, MANGANESE MINES

LOCATION	PRODUCTION	REMARKS
Near Kostinbrod (24 km.) 15 mi. NW of Sofiya; state owned.	Quality: 35 to 40% manganese; probably working at capacity.	Exported.
Near Bela, NE of Burgaz; privately owned.	Quality: 45 to 50% Mn, 30% Fe ('36); probably working at capacity.	Exported
Mine between Ivailovgrad and Lyubimets.	Quality: pyrolusite (60% MnO <sub>2</sub> , 18% Si, 1.5% Fe).	1,500 MT of ore in dumps (6/43); to be exported.

(4) *Copper*. Bulgarian copper mining activity fell during the 1930's, but has recovered recently due to war demands. At present, ore containing between 500 to 1,500 MT of copper is mined annually and is given primary treatment in Bulgaria. Although the Axis copper situation is poor, Bulgarian copper is not important in the overall consideration. Axis firms, including Japanese, have been anxious to secure Bulgarian copper, but Bulgaria seems to have retained sufficient control over its output to attempt (with unknown



Illustration VI - 1. Eliseina flotation plant and smelter.  
Looking southeast across the Iskr River. Railroad sidings in left foreground. Date unknown.

success) in 1942 to increase her supply of insecticides by having her copper ores transformed into copper sulfate. The Plakolnitsa mine, once Bulgaria's most productive copper mine, was nearly exhausted in 1930 so that other mines have since been developed, particularly in the more remote regions (Table VI - 10). It is believed that transport is a major bottleneck in Bulgarian copper mining. The Bulgarian Government has instituted control of all copper stocks, has pushed collection of copper scrap, and has taken over many mines.

#### B. Fuel.

(1) *Coal and lignite.* Due to growing wartime demands, Bulgarian production of coal and lignite has been increased from 1.8 million metric tons in 1938 to 3.2 million in 1942 (100,000 tons of bituminous and the remainder lignite of good quality). Lignite exports have increased, but are small (100,000 tons in 1942).

As elsewhere in Axis Europe, the use of fuel for domestic and commercial purposes has been curtailed to meet require-

TABLE VI - 10  
BULGARIA, COPPER MINES

LOCATION	PRODUCTION	FACILITIES	REMARKS
Belogradchik	Deposits	No transport facilities.	
Burgaz region: Ikonov mine (near Burgaz); Istok mine (near Sv. Nikola (S of Burgaz on coast); deposits at Kharman (Karkharman) (S of Burgaz); Cherni-vrkh (Kara tepe) (12 km. SW of Burgaz); and Rosen (Rossen-bain) field (SE of Burgaz).	Reserves: 200,000 MT of 5% Cu estimated at Ikonov and Istok mines; 180,000 MT of 4½% Cu known at Rosen and Cherni-vrkh. Current production: being repaired for exploitation in fall.	Ores lie as deep as 200 meters; Kharman lacks transport facilities; Cherni-vrkh and Rosen near RR.	Plans to ship ores to Eliseina for smelting. (Illustration VI - 1)
Elshnitsa, in W Bulgaria.	Mine probably in production since chemical plant using ores planned.		
Flachitza	Deposits		Pernik mine authorized to exploit.
S of Panagyurishte, Luda Yana mine; government-operated (since winter 1942/43).	Reserves: 150,000 MT of ore estimated. Capacity: 15-20,000 MT of ore p.a. Quality: Cu content reported 3-5% (and 3 grams of gold per MT). Production: Reported as high as 1,000 MT of metal content p.a.	Mine 50 meters deep; leaching facilities for ore; near RR.	Reported early 1943: mineral no longer exported, but used for domestic copper sulfate. Plans for concentrating and smelting plant at mine reported. Ore was shipped to Eliseina for smelting.
Plakolnitsa copper mine and Eliseina smelter: Copper mine is located ca. 7 km. NW of Eliseina RR station; Smelter on right bank of Iskr River, 200 meters W of Eliseina village; government-operated since 11/40.	Mine: Reserves: estimated between 50,000 and 100,000 MT of 4% Cu or less; production: maximum: 35,000 MT (1926); mine closed in 1930; 3 concessions W of old mine were reported being developed in 1937. Current activities: no information. Smelter: Capacity: flotation plant: 100 MT daily, 1 20-MT blast furnace producing matte (1922 analysis: 69% Cu, 2 kg (kilograms) Ag per MT). Current production: 20-25 MT daily reported.	Mines at 1,200 meters elevation, 140 meters deep; connected with smelter at Eliseina by cable conveyor. Smelter has 3 large chimneys and 60 cm. gauge RR connection with Eliseina station, which has a number of sidings (perhaps as many as 8).	Copper ore received from various Bulgarian mines. Product shipped to Hamburg, Germany. Good photo of smelter available. (Illustration VI - 1)
Ruse	Copper mine reported.		

(5) *Lead and zinc.* Lead and zinc deposits have been developed in the Krdzhali region of the Rodopi Planina (Table VI - 11). Other deposits are reported near Khaskovo, Asenovgrad and in northwest Bulgaria. Although the Germans are reported to prefer zinc to lead, Bulgarian production is not essential to Axis economy.

TABLE VI - 11  
BULGARIA, LEAD AND ZINC MINES

LOCATION	PRODUCTION	FACILITIES	REMARKS
Krdzhali region; Pirin A.G.	Production: 50,000 MT of ore estimated for 1941; perhaps 100,000 tons p.a. by now.	Flotation plant in operation.	Concentrates shipped to Germany.

(6) *Miscellaneous minerals.* The Zlata mine near Trn, from which was produced in 1940 over 31,000 MT of ore containing 237 kg. of gold, was reported exhausted in 1942. Deposits have been reported of antimony, bauxite, uranium, nickel, titanium, molybdenum, and silver (the last in connection with lead and zinc). The extent of their exploitation is unknown. Mica was reported found between Kamilski-dol and Ivailovgrad.

ments of war industries. Probably 90 per cent, and possibly 95, of the total output is now derived from the state mines. By far the most important deposits are those at Pernik, where most of the production increase has occurred. Very small amounts of coke and briquettes are produced in Bulgaria. Estimates for 1941 put production of coke at 6,000 MT and of briquettes at 100,000 MT.

(a) *Pernik mines.* The Pernik mines are in a valley 7 miles long by 4 miles wide and 22 miles WSW of Sofia. The mining and station installations cover an area of about 3½ square miles in the middle of the valley. Figure VI - 1 shows locations of the principal mines, briquette plant and separator. The mine buildings are either concrete or steel frame with wooden sides. The pumping station and hand separating stations are covered with wooden sheds. The most vulnerable points, in approximate order of importance, are reported to be: (1) the large machine and maintenance shop in the center of town and a few yards east of the Administration buildings, destruction of which would seriously curtail, if not halt, production; (2) the railroad

~~Confidential~~

marshalling yards; (3) the mine elevator buildings; (4) the bridge over the Struma River; and (5) the briquette plant. Loss of Pernik coal would very seriously interfere with the Bulgarian war effort, since the Pernik mines have supplied most of the coal used by Bulgarian railroads and industries.

There are conflicting reports as to production. It is believed that the best estimate is an annual rate of production of roughly 2.8 million MT. The mines yield lignite of good quality, the number of calories per kg. varying between 4,200 and 6,000. Analysis reveals 35 to 42 per cent carbon, 11 to 15 per cent water, 13 to 24 per cent ash, and 1.5 to 2.5 per cent sulfur. About 8,000 workers are employed. Known reserves are estimated at 150 to 200 million MT. The briquette plant is reported to have produced more than 90,000 MT of egg- and brick-shaped briquettes in 1938 and increases in production have since been reported.

In the past about 35 per cent of the output has been taken by the State railroads, 23 per cent by industry and 42 per cent for heating purposes. An unconfirmed report states that 60 per cent of the output is now sent to a synthetic oil refinery in Beograd (Belgrade), Yugoslavia. It has frequently been reported that Pernik coal was to be made the basis for fertilizer, synthetic gasoline and heavy chemical plants, but it is not known whether any of these projects are beyond the planning stage.

(b) *Other coal mines.* There are numerous other coal mines in Bulgaria, but neither individually nor collectively do they approach Pernik in importance. There are State lignite mines near Bobov-dol, Lom and Rakovski and privately owned lignite mines near Pirin and northeast of Burgaz. There are several bituminous coal fields, reportedly very difficult to work, around both Sliven and Plachkovtsi. Total output of bituminous coal is probably about 180,000 MT per year. There is a small anthracite mine near Svoge, which is difficult to work and which yields only a few thousand tons per year. Small coke ovens are reported at Plachkovtsi (yearly capacity 11,000 MT) and at Kazanik (yearly capacity 4,400 MT). Small briquette plants are said to be located at Pirin and near Rakovski.

## (2) Wood.

(a) *Location.* Roughly 6.5 million acres of Bulgaria, a little more than one-fourth of the total land area, are forested. More than 75 per cent of the forest area has hardwoods, chiefly oak (about 50 per cent), beech (25 per cent) and walnut. The best hardwood forests are found on the northern slopes of the Stara-Planina, on the Sredna Gora, Strandzha, Rila and Rodopi ranges. Almost all the remaining forest area is in spruce and fir (10 per cent) and pine (5 per cent); The best coniferous forests are in the Rila, Pirin, and Rodopi mountains. Northern Bulgaria (the Danube Plain) and nearly all the river valleys have been almost denuded by fire and irrational exploitation. However, the government has been pursuing a conservation and reforestation program during the past 15 years.

(b) *Production.* Production of wood is small but sufficient for nearly all domestic requirements. The chief use of wood is as a fuel, for heating homes and commercial and public buildings. Except for wood pulp (cellulose), imports are negligible, while exports consist almost entirely of charcoal (14,000 MT in 1941). In 1938 Bulgaria produced 1,150,000 cu. yds. of lumber, 4,700,000 cu. yds. of firewood and 37,500 tons of charcoal.

(c) *Cutting.* In 1935 there were 2,000 primitive sawmills and 146 modern sawmills with 399 circular saws and 393 bandsaws. A more recent report (probably referring to 1939 or 1940) states that there are 162 lumber mills employing 1,789 workers. The same report states that there are 100 furniture, wood-finishing and barrel plants employing 2,125 workers. One center of the lumber industry appears to be an area along the Sofiya-Plovdiv railroad, especially near the stations of Belevo and Gara-Saranovo, where several large sawmills and lumber yards are reported.

(3) *Petroleum.* Bulgaria is wholly dependent for petroleum on outside sources, chiefly Rumania. In 1940 Bulgaria imported 90,600 MT of petroleum and petroleum products from Rumania and 1,700 MT of specialized products from Germany and the United States.

(a) *Location of refineries.* There are three small refineries at Ruse (opposite Giurgiu, Rumania), terminus of an oil pipe line from Ploesti. These refineries, and their annual capacities, are: (1) The Vacuum (22,000 MT), (2) The Bulgarian Petroleum Industry (20,000 MT) and (3) The Suetlina (19,000 MT). Although total capacity was 61,000 MT, only 33,000 MT were processed in 1938.

(b) *Production.* There are conflicting reports as to current operations at these refineries. One source reports that they are producing gas oil and some lamp oil, whereas another and probably more reliable source reports that they are all shut down. There is an unconfirmed report that one of the refineries was blown up in 1941.

There have been numerous reports that one or more companies have been formed to produce synthetic gasoline or tar oils from lignite at Burgaz, Pernik or elsewhere. It is unlikely that any of these projects have been completed.

The shortage of petroleum and petroleum products in Bulgaria is severe. Plans were announced early in 1943 for the conversion of all motor trucks with a capacity of 2.5 MT or more to produce gas. Supplies of gasoline have been so low at times that Lufthansa and courier planes were temporarily grounded.

Bulgaria produced 13,000 MT of castor oil in 1942, thus making it the largest European producer of this important airplane engine lubricant. The most important plant is that located near the railroad station at Kostinbrod. Another important producer is the Loskutov plant at Sofiya.

(c) *Storage.* Bulgaria has known commercial storage facilities for roughly 61,000 MT of petroleum and petroleum products, plus a reported 30,000 MT of new capacity (Table VI-12). In addition, the Bulgarian military authorities have certain storage facilities, which may have a capacity of as much as 25,000 MT (Table VI-13). Information on the military installations is poor, and even the existence of the facilities mentioned needs confirmation. It should be noted that the number of tank cars available in Bulgaria is reported to be extremely limited.

TABLE VI - 12  
BULGARIA, COMMERCIAL OIL  
STORAGE FACILITIES

	CAPACITY METRIC TONS
<i>Ruse</i>	
Petrole Co.: (a) 12 tanks holding 600-2,500 MT each.....	13,780
(b) 45 tanks holding less than 400 MT each....	3,900
Sugar Refinery: 3 tanks.....	9,000

TABLE VI-12 (Continued)

	CAPACITY METRIC TONS
First Bulgarian Petroleum Industry:	
(a) 3 tanks holding 1,200-2,750 MT each.....	5,150
(b) 28 tanks holding less than 300 MT each.....	650
Svetlina Co.: number of tanks not known; capacity approximately.....	3,000
Total capacity in Ruse.....	35,480
<i>Burgaz</i>	
Petrole Co.: (a) 4 tanks holding 1,350-6,700 MT each.....	17,150
(b) 7 tanks.....	520
This installation is in the SW part of town on shores of Lake Vaya-Koi and the canal linking lake and sea. There is a pipeline to the S mole, with three pipelines running on the quay, two of 6 inches and one of 4 inches. (Note: 10,000 MT of this capacity are reported to have been leased to the military authorities.)	
Boyadjieff: 2 tanks.....	160
Total capacity in Burgaz.....	17,830
<i>Varna</i>	
Petrole Co.: 3 tanks.....	670
Dimanzoff Bros. (German; reported to have been built by Germans to store oil from Batum): 3 large tanks near SE end of Black Sea/Lake Devna canal.....	30,000
Total capacity in Varna.....	30,670
<i>Svishtov</i>	
Benzogas: (a) 2 tanks.....	4,050
(b) 5 tanks.....	540
Union Agrarian Cooperatives: 5 tanks.....	290
Total capacity in Svishtov.....	4,880
<i>Lom</i>	
Union Agrarian Cooperatives: 4 tanks.....	200
Momtcheff: 2 tanks.....	30
Total capacity in Lom.....	230
<i>Sofiya</i>	
Petrole Co.: 7 tanks.....	420
Benzogas: 4 tanks.....	55
Union Agrarian Cooperatives: 5 tanks.....	125
Boyadjieff: 6 tanks.....	60
Napred Cooperative: 4 tanks.....	120
Total capacity in Sofiya.....	780
<i>Plovdiv</i>	
Petrole Co.: 7 tanks.....	570
Benzogas: 1 tank.....	30
Total capacity in Plovdiv.....	600
<i>Pleven</i>	
Petrole Co.: 2 tanks.....	130
<i>Stara-Zagora</i>	
Petrole Co.: 4 tanks.....	160
<i>Gorna Orekhovitsa</i>	
Petrole Co.: 2 tanks.....	20
<i>Gabrovo</i>	
Petrole Co.: 3 tanks.....	60
<i>Cherven-Breg</i>	
Petrole Co.: 1 tank.....	25

<i>Khaskovo</i>	
Petrole Co.: 2 tanks.....	30
<i>Radomir</i>	
Petrole Co.: 2 tanks.....	75
<i>Kyustendil</i>	
Petrole Co.: 1 tank.....	10
Total Bulgarian commercial oil storage facilities.....	91,260

TABLE VI-13  
BULGARIA, MILITARY OIL STORAGE FACILITIES

	CAPACITY METRIC TONS
<i>Sofiya, Sliven, Yambol, and elsewhere</i>	
There are reports that the army has built as many as 50 storage tanks in various parts of the country, each with a capacity of 50 tons. Total capacity probably does not exceed.....	
	2,500
<i>Burgaz</i>	
It is reported that four large benzine tanks have been constructed between the naval barracks and the slaughter- house. In 1940 the Burgaz Port Administration was pro- posing to build tanks with a capacity of 4,000 MT for storing reserve fuel oil, including benzine. On the assump- tion that these reports refer to the same installations, total capacity may be estimated at.....	
	4,000
<i>Varna</i>	
A naval fuel storage installation is reported. The tanks are situated on the S bank of the canal, just W of the shore end of the breakwater which protects the canal from the sea. The tanks are surrounded by earthworks. There are: one 1,000 ton tank and two 250 MT tanks.....	
	1,500
New underground tanks are believed to be under con- struction on the shore just S of the existing installation.	
<i>Nemirovo</i>	
Underground storage facilities are reported here. One source reports that there is one very large tank situated 500 meters from the station in the direction of a hill near the station. The tank is said to be connected to the station by pipeline. Capacity is not known, but say.....	
	1,000
<i>Plovdiv</i>	
One large tank reported.....	7,000
<i>Bozburishte</i>	
One large tank reported at an airfield near the village..	7,000
<i>Rakovski</i>	
One underground concrete tank is reported.....	2,000
Total military oil storage facilities*.....	25,000 est.

## C. Quarries.

Bulgaria has much limestone, granite, marble, salt, plastic clay, kaolin, barite, talc, gypsum, silicious-abrasive (kieselguhr), and certain other minerals. Production figures for most of these minerals are not available, but an indication of availability is provided by the fact that in 1932 there were 2,136 quarries and clay pits, 93 lime quarries and 83 sand quarries. In 1941 there was an estimated production of 15,000 MT of kaolin, 15,000 MT of rock salt, 65,000 MT of sea salt, and 250 MT of abrasive. The peak production of talc was 17 MT in 1935.

(1) *Limestone.* Limestone is abundant in the Rodopi Planina and Stara-Planina. It is converted to building lime

\*These facilities are not referred to in each case as military facilities, but are listed here as such since it seems improbable that they are commercial installations.

in primitive ovens. Limestone quarries are said to be located near Selo Kounine, Gara Zemen, Gabrovo, and Plovdiv. There is a stone quarry near Varna, on the SW side of Lake Devna.

(2) *Marble*. Quarries are found near Pestiers, Asenovgrad, Kyustendil, and Kazanlk.

(3) *Granite*. Quarries of granite are near Plovdiv, Mount Vitosha (south of Sofiya), and Samokov.

(4) *Salt*.

(a) *Provadiya*. These salt mines are located 6 km. SE of the town of Provadiya and 250 meters west of Mirovo railroad station. Production is probably about 15,000 MT per year. Exploitation has been under the Pernik Mines Administration.

(b) *Atanasovo*. These sea salt pans are just north of Burgaz and cover a large area (Fig. VI - 7). Production is probably well over 30,000 MT per year.

## 64. Electric Power

### A. Extent of electrification.

Adequate electric power has been developed in only two areas: Sofiya, and Plovdiv/Pazardzhik. The Stara-Zagora area is also fairly well served. These areas are served by the largest plants in the country, to which they are connected by high-tension (mostly 60 kv.) transmission lines (Fig. VI-2). Other regions are served by medium-sized or small local plants with short transmission lines, or by a large number of very small plants, averaging 14 kva. installed capacity. Small installations serving primarily local mills and sunflower-oil plants, in many instances also provide lighting for villages.

In 1939, generating capacity was distributed by regions as indicated in Table VI - 14.

TABLE VI - 14  
BULGARIA, INSTALLED GENERATING CAPACITY  
BY REGION, 1939

REGION	INST. CAP. (H.P.)	PER CENT OF TOTAL CAPACITY
Sofiya .....	73,690	57.04
Plovdiv .....	13,300	10.30
Stara-Zagora .....	12,800	9.91
Burgaz .....	6,800	5.26
Total South Bulgaria .....	106,590	82.51
Total North Bulgaria .....	22,602	17.49
Total Bulgaria .....	129,192	100.00

Installed generating capacity in 1936 was divided between steam, hydro and Diesel plants as shown in Table VI - 15.

TABLE VI - 15  
BULGARIA, INSTALLED GENERATING CAPACITY  
BY TYPE OF PLANT

TYPE	NUMBER	INST. CAP. (H.P.)	PER CENT OF TOTAL CAPACITY
Hydro .....	30	55,157	42.6
Steam .....	11	57,775	44.8
Diesel .....	70	16,260	12.6
Total .....	111	129,192	100.0

In 1941, there were 135 plants, of which 121 were in operation. About 60 out of 97 towns, and 417 out of 5,658 villages, have electric lighting. Kwh. consumption of electric power

per capita in 1941 was very low (about 45.26). By order of the Bulgarian Cabinet, as of February 1, 1943 all electricity works and electric energy distributing undertakings were placed under government control.

### B. Transmission network.

In 1934, Bulgaria had 1,064 miles (1,713.59 km.) of high-tension transmission lines. The most extensive long-distance networks are around Sofiya, Plovdiv/Pazardzhik and Stara-Zagora. Lines are few and short in other regions. The most common transmission voltages are 60, 15 and 6 kv.

Plans for the electrification of northern Bulgaria, poorly served by small local (mostly Diesel) plants, have been pushed by the government in recent years under a directorate for the electrification of northern Bulgaria. These include the construction of 594 miles (956 km.) of line. Surplus power of the Sofiya area is to be sent over a 110-kv. line, Sofiya/Kurilo/Pleven, supposed to be finished at the end of 1942. Main transformer stations are to be at Kurilo, Mezdra, Chervenbreg, and Pleven, with smaller substations planned for ten other junction points. Small transformer stations in 243 villages will supply them with power from the network.

Information on switching and transformer installations is almost unobtainable. The most important installations are probably those connected with long-distance supply lines to Sofiya and Plovdiv.

### C. Self-sufficiency in power supply.

Bulgaria neither imports nor exports electric power. Production has shown a steady increase in recent years, as shown in Table VI - 16.

TABLE VI - 16  
BULGARIA, ELECTRIC POWER PRODUCTION

YEAR	MILLIONS OF KWH.
1938 .....	235.7
1939 .....	267.7
1940 .....	297.1
1941 .....	303.2

The three per cent increase of 1941 over 1940 was due almost entirely to an increase in steam generation. Over half of the power produced is hydrogenerated.

Bulgarian production by type of plant for 1940 and 1941 is shown in Table VI - 17.

TABLE VI - 17  
BULGARIA, POWER PRODUCTION BY TYPE OF PLANT

TYPE	PRODUCTION 1940		PRODUCTION 1941	
	MILL. KWH.	PER CENT	MILL. KWH.	PER CENT
Hydro .....	170.7	57.45	169.7	55.97
Steam .....	101.9	34.30	107.7	35.52
Diesel .....	18.8	6.33	19.7	6.50
Mixed .....	5.7	1.92	6.1	2.01
Total .....	297.1	100.00	303.2	100.00

In 1936, of 167,790,102 kwh. produced, 59.8 per cent was used for industrial power, 15.3 per cent for private lighting, 5.1 per cent for street lighting, 0.91 per cent for household power and heat, and 18.94 per cent for plant consumption and transmission losses. Industrial power consumption has risen steadily from 100.1 million kwh. in 1938 to 138.0 million kwh. in 1941.

### D. Consumption.

Since September 1942, use of electricity has been restricted

as a result of drought and the decreasing quantities of coal available for power plants. The strictness of the regulations regarding use of power during peak load hours indicates a severe shortage. These regulations include: (1) No use of home electrical equipment between 5 and 9 p.m. and 7:30 and 8:30 a.m.; (2) lighting in homes, restaurants, stores to be reduced to a minimum during the same hours; (3) no electric window signs and new window lighting allowed; (4) elevators, cranes, heaters in industry, workshops, cooperatives to stop between 5 and 9 p.m., and (5) use of power for heating rooms, offices, stores, etc., forbidden at all times. As of October 1, 1942, the Ministerial Council has decreed that no noon pause is to be made during working hours in all government, communal, and autonomous offices. The Trade Minister has reduced commercial business hours to between eight and ten hours daily.

#### E. Diesel plants.

Bulgarian thermal power is of two kinds: steam and Diesel. Diesel plants are small and of local importance only. Fuel oil is imported chiefly from Rumania. Prices are high because of heavy government taxation. The principal Diesel plants about which information is available are shown in Table VI-18.

TABLE VI - 18  
BULGARIA, DIESEL GENERATING PLANTS

NAME	LOCATION	INST. CAP. KVA.	REMARKS
Gabrovo.....	On Yantra River, near Gabrovo	635	Supplies Gabrovo
Lom.....	In or near Lom	310	Supplies Lom

NAME	LOCATION	INST. CAP. KVA.	REMARKS
Pleven.....	In or near Pleven	740	Supplies Pleven
Provadiya.....	In or near Provadiya	150	Supplies Provadiya
Ruse.....	In or near Ruse	1,280	Helps supply Ruse
Shumen.....	In or near Shumen	535	Supplies Shumen
Sliven.....	In or near Sliven	760	Supplies Sliven
Varna.....	In or near Varna	1,580	Helps supply Varna
Vidin.....	In or near Vidin	530	Supplies Vidin

Other Diesel plants are located in or near Kazanlk, Petrich, Razgrad, Svishtov, Trgovishte, Trnovo, and Yambol. (See Fig. VI - 2 for small plants.)

#### F. Steam plants.

Bulgaria is well supplied with coal, over 90 per cent of which is lignite. In 1934, the electric power industry consumed 69,500 metric tons. Coal plays an indispensable role in the economics of Bulgarian electric power, for the torrential character of the rivers necessitates the use of steam plants during periods of drought and for peak loads. Important steam plants are shown in Table VI - 19.

TABLE VI - 19  
BULGARIA, STEAM GENERATING PLANTS

NAME	LOCATION	INST. CAP. KVA.	REMARKS
Batanovtsi ...	In or near Batanovtsi (near Pernik)	1,130	Standby station for Pastra hydro plant. Owned by Granitoid Co.
Kurilo.....	In or near Kurilo (N of Sofiya)	12,800	Reserve for Sofiya and en- viroins. Supplies Sofiya street railways. Burns lig- nite from Pernik mines.

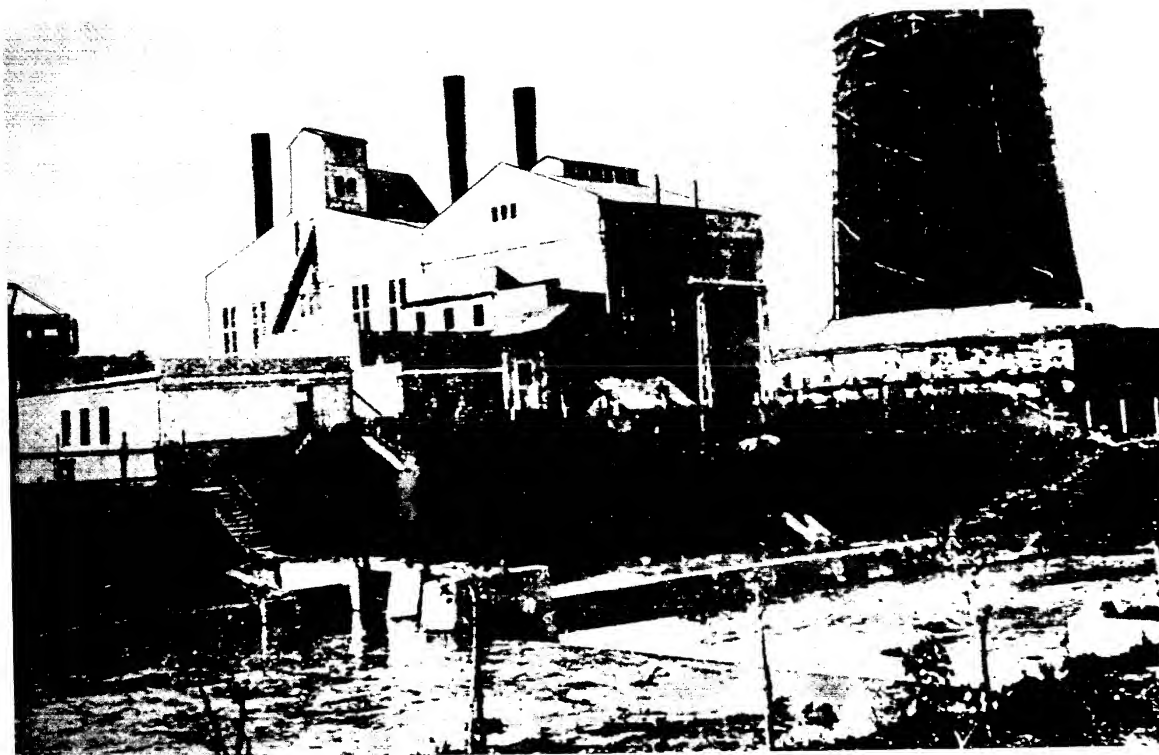


Illustration VI - 2. Pernik steam plant.  
Largest steam plant in Bulgaria, on the Struma River at the Pernik mines.





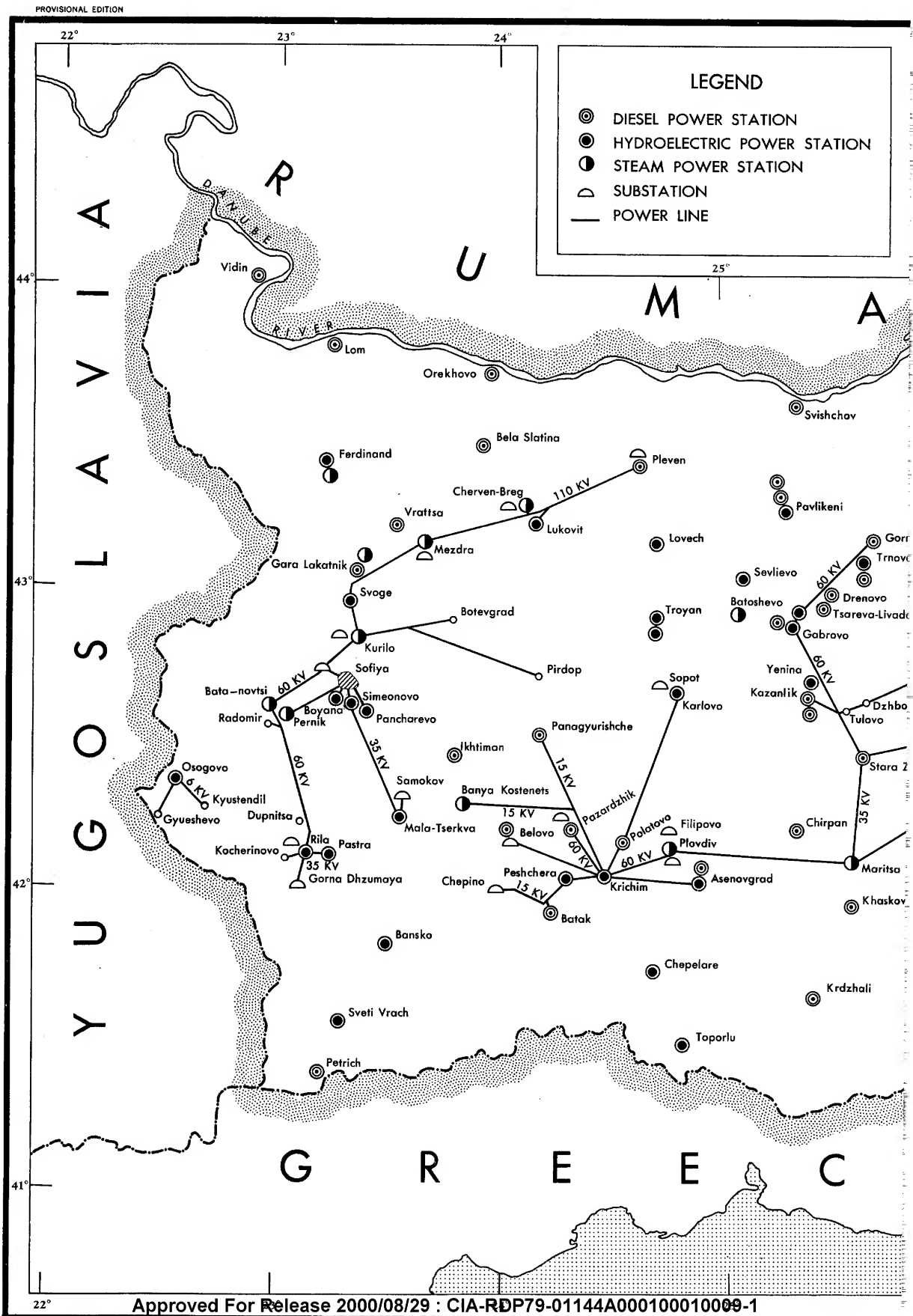


TABLE VI - 19 (Continued)

NAME	LOCATION	INST. CAP. KVA.	REMARKS
Maritsa.....	At Maritsa lignite mines, on main railway line to Istanbul	1,000 to 5,000	Supplies mine and Stara-Zagora region. Began operations spring of 1938.
Pernik.....	On Struma River, at (small plant) Pernik mines	500	Owned by mines. May be connected with large Pernik station.
Pernik.....	On Struma River, at (large plant) Pernik mines	11,500 to 32,000	Owned by mines. Output in 1938: 23 million kwh. Supplies Sofiya area, Struma Valley up to Krupnik, Pernik mines.
Plovdiv.....	In or near Plovdiv	2,240	Probably peak load for Krichim hydro plant. Supplies Plovdiv, Pazardzhik and surrounding region.
Tscherno-More.	At Tscherno-More mine, near Burgaz	3,635	No information.
Varna.....	In or near Varna	9,000 (kw.)	New plant. Probably steam. To be finished summer of 1943.
Ruse.....	In or near Ruse	—	New plant. No information on details.

The Directorate for Electrification and Industrial Establishments under the Ministry of Public Works is studying the expansion of the Pernik steam plant, already the largest in Bulgaria. (Illustration VI - 2.) At the same time, a new steam plant in the Pernik area, with an ultimate capacity of 70,000 kw., is apparently under construction, with an order to Maschinenbau, Goerlitz, for three condensation turbines of 12,500 kw. each.

#### G. Hydroelectric plants.

Bulgaria is rich in water power. The total potential has been estimated as high as 1,000,000 hp. The rivers, however,

have rather constant high water in spring and prolonged periods of very low water in summer and fall, punctuated by short but destructive floods. The torrential character of the rivers makes their utilization difficult for power production. Construction of comparatively large reservoirs and the inter-connection of hydro and steam plants have helped.

The principal rivers utilized or capable of utilization are: Iskr, Struma, Rilska, Bistritsa, Topolnitsa, Yelli Dere, Krichin (Vatscha, Watscha) (Illustration VI - 3), Arda, Tundzha, Kamchiya, Yantra, Osm, Rositsa, and Vit. Only a small part of the potential hydro power has thus far been exploited. In 1934 there were 17 hydro plants with an installed capacity of more than 200 hp., distributed as shown in Table VI - 20.

TABLE VI - 20  
BULGARIA, HYDROELECTRIC GENERATING PLANTS  
OF OVER 200 HP. INSTALLED CAPACITY

REGION	NUMBER OF PLANTS	TOTAL HP.	PER CENT OF TOTAL
Sofiya.....	8	39,245	72.8
Plovdiv.....	2	11,625	21.5
Pleven.....	6	2,360	4.4
Stara-Zagora.....	1	700	1.3
Total.....	17	53,930	100.0

Small waterfalls provide power to a very large number of plants which supply saw mills, flour mills, sunflower-oil plants, etc.

(1) *Location of plants.* Hydro plants, which are located mostly in mountain valleys, generally utilize the medium or high heads. Headrace canals are rather long and are sometimes built underground. Table VI - 21 lists the most important hydroelectric plants for which details of construction and operation are available.

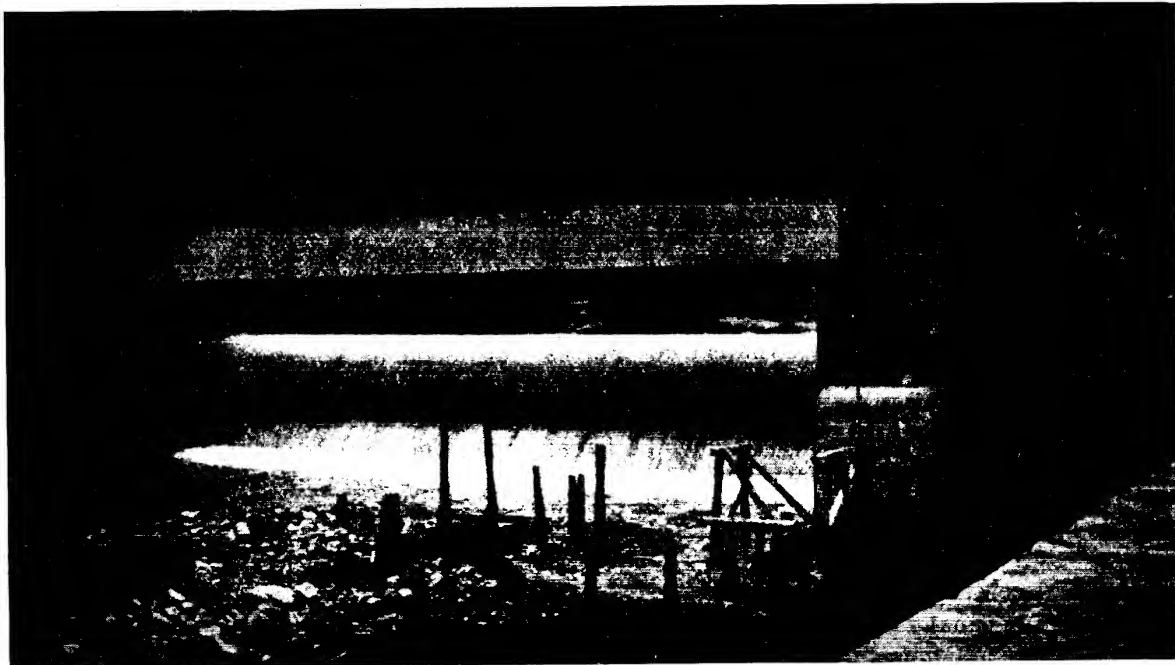


Illustration VI - 3. Krichim hydroelectric plant.  
Cylinder dam on the Vucha River; seen from downstream. Weir on right.



Illustration VI - 4. Krichim hydroelectric plant.  
General view looking downstream. Shows (left to right) the equilibration shaft, valve chamber, penstock, and plant. Krichim village in right background.

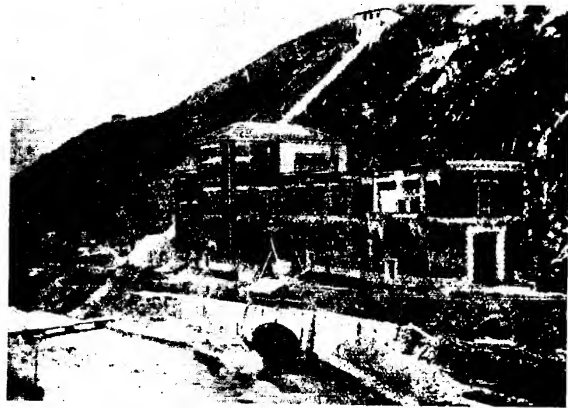
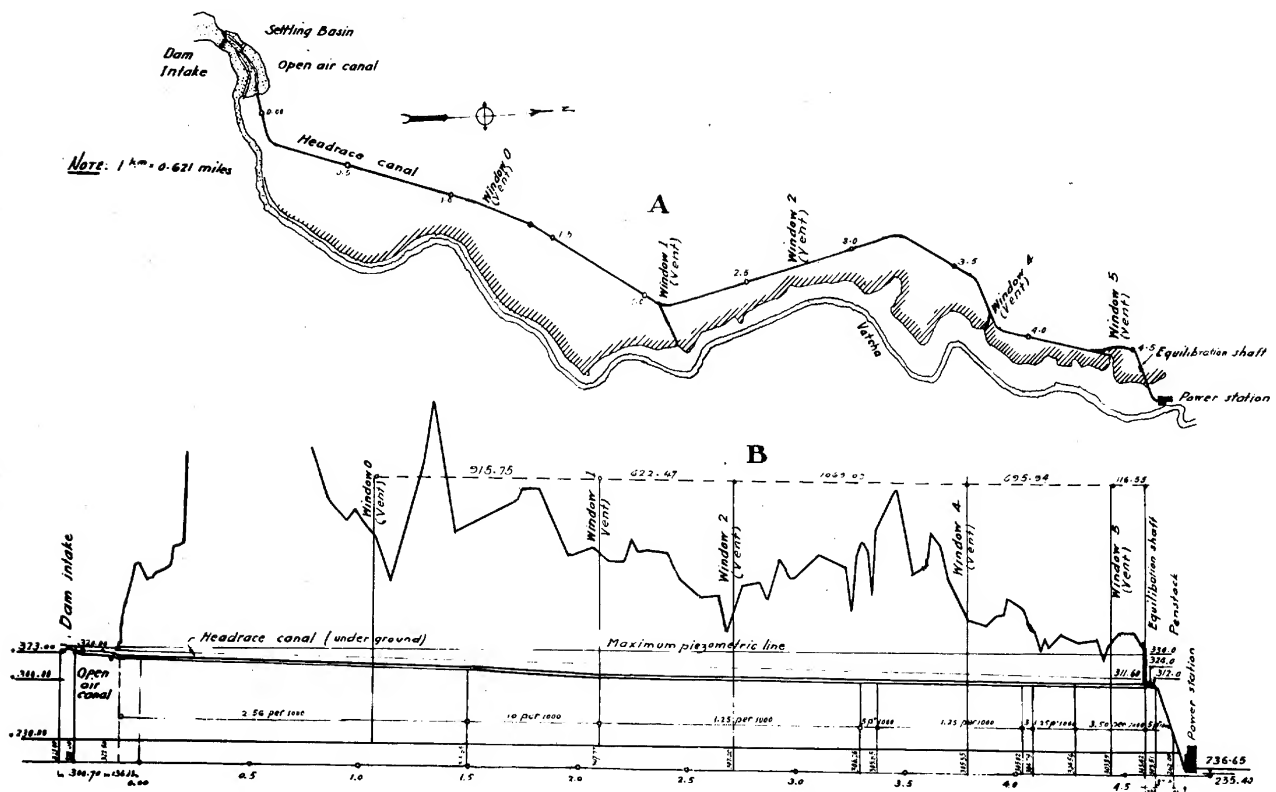


Illustration VI - 5. Krichim hydroelectric plant.  
The plant when under construction, seen from the right bank looking downstream.



~~Confidential~~TABLE VI - 21  
BULGARIA, HYDROELECTRIC PLANTS

NAME	LOCATION	INST. CAP. KVA. UNLESS HP. SPECIFIED	REMARKS
Beroff.....	On Yantra River, near Trnovo	240 (hp.)	Began operations 1906.
Bansko.....	On Glaz Dere, near Bansko	125	Supplies Bansko.
Bojana.....	At foot of Vitosha Mt., 4 mi. (6 km.) S of Sofiya	1,720	Owned by Sofiya munici- pality. Helps supply Sofiya.
Yenina.....	On Yenina brook, near Yeninska River, Yenina, 3.7 mi. (6 km.) N of Kazanlk	600	Helps supply Kazanlk.
Garliano.....	On Bistritsa River, (Osogovo) 9 mi. (15 km.) from Kyustendil	640	Supplies Kyustendil.
Kalomen.....	On Yantra River, near Drenovo	300 (hp.)	Supplies Drenovo.
Krichim.....	On Krichim River, (Vucha; near Krichim Watscha)	10,000 to 20,000	Supplies Plovdiv/Pazard- zhik and surrounding re- gion. Connected with Plovdiv steam station.
(Illusts. VI - 3 to VI - 6)			
Karlovo.....	On Stara-Reka River, (Illust. VI - 7) near Karlovo	1,000	Supplies Karlovo.
Lovech (Osm).....	On Osm River, near Lovech	360	Supplies Lovech.
"Luleff".....	On Yantra River, near Gabrovo	400 (hp.)	Supplies textile plant.
Mala-Tserkva.....	On Rila canalization of Iskr River, near Samokov, 21 mi. (34 km.) from Sofiya.	6,000 to 12,000 (hp.)	Owned by Sofiya munici- pality. Helps supply So- fiya/Struma Valley up to Krupnik.
Mari-Vir.....	On Topolnitsa River, near Mari-Vir	No in- forma- tion	Under construction in 1938. No information as to whether in operation.
Pancharevo.....	At Pancharevo on (Illust. VI - 8) Iskr River, ca. 9 mi. (14 km.) from Sofiya	3,180	Supplies Sofiya.
Pastra.....	On Rilska River, (Illust. VI - 9) near Pastra	10,900	Base load. Owned by Granitoid Co. Supplies Sofiya/Struma Valley up to Krupnik, Granitoid plants.
Rila.....	On Rilska River, (Illust. VI - 9) Rila monastery	9,650	Peak load. Owned by Granitoid Co. Supplies Sofiya/Struma Valley to Krupnik, Granitoid plants. Important switch- ing station in connection with plant.
"Peeff".....	On Iskrets River, near Svoqe	285 (hp.)	Began operations 1928.
Peshchera.....	In or near Peshtera (Pestera)	350 (hp.)	—
Rositsa.....	On Rositsa River	740 (hp.)	Began operations 1927.
Simeonovo.....	On Rila canalization of Iskr River	6,300 to 10,500	Owned by Sofiya munici- pality. Supplies Sofiya and surrounding regions.
Sini-Vir.....	On Yantra River, near Sini-Vir	250	Began operations 1925.

(2) *Projected dams and plants.* In addition, construction of new dams and hydro plants is going forward. A dam on the Beli Iskr, 50 miles (80 km.) SE of Sofiya, is scheduled to begin supplying Sofiya with additional water by 1944, and a power plant connected with it is to produce approximately 20 million kwh. per year. A dam at Sevlievo

on the Rositsa River in northern Bulgaria (reservoir capacity 160 million cu. m.), scheduled for completion in 1945, will have two power plants associated with it, producing 33 million kwh. per year. The Ministry of Agriculture has appropriated approximately \$200,000 (21 million levas) to build two new power and irrigation dams on the Topolnitsa and Tundzha Rivers in central Bulgaria. Germany is to provide equipment. Osm (Lovech), supplying the Pleven district, is to be enlarged to 2,500 hp. The Bichkinya plant, in the Balkan Mountains, with 4,500 hp. installed capacity and an annual output of 13 million kwh. to the textile center of Gabrovo, is under construction. Another hydro plant being built on the Panega (Panika) River near Lukovit was scheduled for completion during the winter of 1942-43. According to recent broadcasts, a new plant on the Ogosta River will be opened in 1944. Labor and raw materials shortages have probably delayed many of these projects.

#### H. Consumer distribution.

Almost all power in Bulgaria is distributed as three-phase, 50-cycle, alternating current. Voltages are fairly well standardized at 220 volts for lighting and 380 volts for power. Edison-type sockets and pin-type attachment plugs are in general use; bayonet sockets are found only in the Sofiya



Illustration VI - 7. Karlovo hydroelectric plant.  
Plant on the Stara Reka (River). Supplies Karlovo.

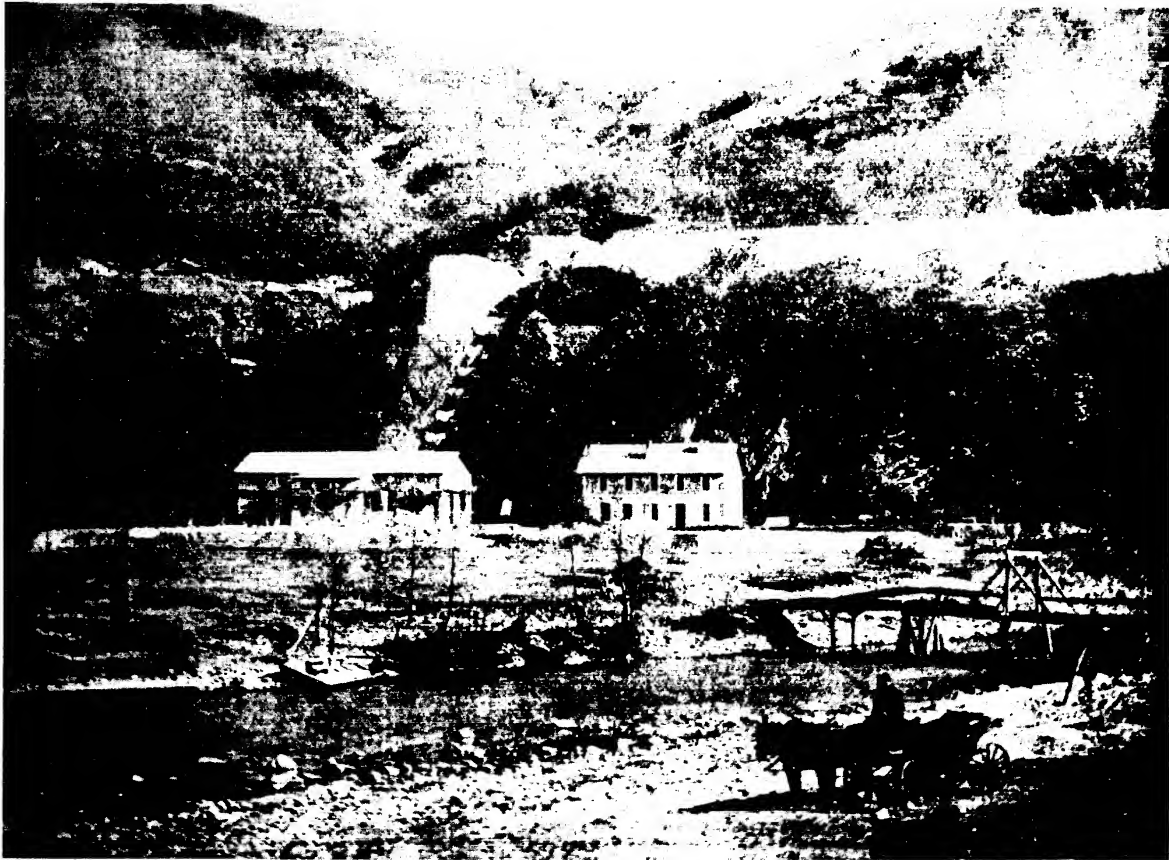


Illustration VI - 8. Pancharevo hydroelectric plant.

Plant which supplies Sofiya, 14 kilometers (8.4 miles) from the city on the Iskr River. Photograph taken when plant was under construction.

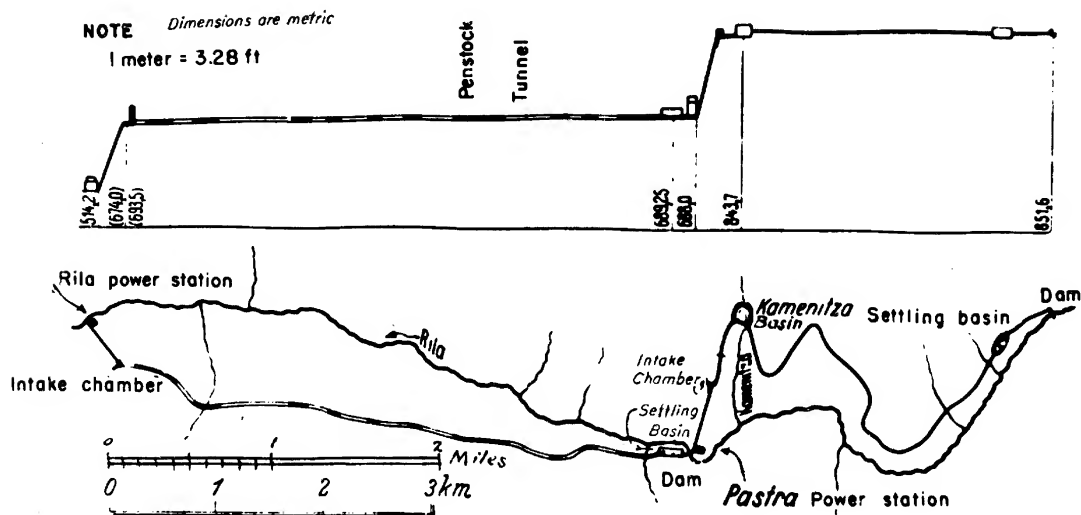


Illustration VI - 9. Rila and Pastra hydroelectric plants.

Longitudinal section and plan of the Rila and Pastra plants on the Rilska River.

street lighting system. Low voltage distribution is generally by overhead lines. Wooden poles are standard, but larger cities sometimes use concrete poles. Electric current characteristics of Bulgarian cities as of January 1, 1936 are shown in Table VI - 22.

TABLE VI - 22  
BULGARIA, ELECTRIC CURRENT  
CHARACTERISTICS OF CITIES

CITY	POPULATION	TYPE OF CURRENT	VOLTAGE
Asenovgrad.....	17,817	AC	220/380
Burgaz.....	36,099	AC	220/380
Dupnitsa.....	16,071	AC	220/380
Gorna Dzhumaya.....	10,028	AC	220/380
Gabrovo.....	13,823	AC	220/380
Gabrovo suburbs.....	—	AC	220/380
Khaskovo.....	26,622	DC	220
Kazanlk.....	15,097	AC	120/210
Krasno Selo.....	—	AC	220/380
Kyustendil.....	16,386	AC	220/380
Lom.....	1,480	DC	440
Panagyurishte.....	10,188	AC	220/380
Panagyurishte suburbs.....	—	AC	220/380
Pazardzhik.....	23,387	AC	220/380
Pernik.....	15,977	AC	220/380
Petrich.....	10,121	DC	220
Pleven.....	31,754	AC	220/380
Plovdiv.....	100,485	AC	220/380
Plovdiv suburbs.....	—	AC	220/380
Razgrad.....	15,700	AC	220/380
Ruse.....	49,388	AC	120/210
Samokov.....	11,031	AC	220/380
Selo Nadezhda.....	10,104	AC	220/380
Shumen.....	25,734	AC	220/380
Sliven.....	30,683	AC	220/380
Sofiya.....	287,976	AC	150
Sofiya suburbs.....	—	AC	220/380
Stara-Zagora.....	29,857	AC	220/380
Svishtov.....	12,122	AC	220/380
Trgovishte.....	10,421	AC	220/380
Chirpan.....	11,308	DC	220
Trnovo.....	14,000	AC	220/380
Varna.....	70,183	AC	120/210
Vidin.....	18,589	AC	220/380
Vratsa.....	—	AC	220/380
Yambol.....	—	AC	220/380

## 65. Manufacturing

Information on Bulgarian manufacturing plants is meager. This topic is based on such reports as are available.

### A. Metals and machines.

(1) *Metallurgy.* Except for some lead production in the Sofiya region, there is no metallurgy in Bulgaria. All ores, concentrates, etc., are exported for metallurgical treatment. Although Bulgaria has been able to maintain some control over these exports, there is a metal shortage in the country. Old metals are collected, stocks of metals have to be registered with the government, and the coinage has been debased. Iron and steel are imported in semi-finished and finished form, the quota allotted to Bulgaria for the first quarter of 1943 being 11,000 tons. Bulgarian lead production is indicated in Table VI - 23.

TABLE VI - 23  
BULGARIA, LEAD PRODUCTION

LOCATION	CAPACITY	FACILITIES	REMARKS
Kurilo: Damenretz plant	12 MT of lead ingot daily	3 furnaces; new 7-MT daily capacity fur- nace under con- struction.	Uses Bulgarian ore (but not from Krdzhali region). ¾ of product to Germany, ¼ for Bulgaria.
Sofiya	1,000 MT of lead p.a.	—	Confirmation needed.

(2) *Industrial and agricultural machines.* The metal working industry (See Fig. VI - 1) has a small capacity, insufficient to supply ordinary civilian and agricultural demands. Metal shops furnish simple tools and equipment, but are not equipped to make complicated machines or their specialized components. Sofiya shops produce storage batteries, wire, locomotive boilers, insulators, print type, hardware, etc. Bulgarian industry does not produce such items as bakery equipment, shoe repair machinery, power shovels, graders, motor cars, agricultural machines (of which there is a shortage) nor textile machinery. Imports include bicycles, sewing machines, and all kinds of spare parts. Table VI - 24 gives a selected list of the more important metal shops.

TABLE VI - 24  
BULGARIA, METAL SHOPS

LOCATION AND FIRM	PRODUCTION	REMARKS
<i>Burgaz</i> Veriga S.A.	Wire and nails.	Metal shop.
<i>Drenovo</i> State RR shops	Metal bridges.	
<i>Gabrovo</i> Slovitza & Rocitza	Mica.	
<i>Pernik</i> Bulgarski Zelezni Zavody (under military control)	15 MT of iron rods for re- inforced concrete a day or 2,000 MT p.a.	Raw material: Scrap and slag. Production used for military work along Turk- ish frontier and Aegean Sea.
<i>Pleven</i> Ivan Bourjeff	Made fire-proof safes.	Metal shop.
K. Grassev	Agricultural machinery.	Metal shop.
Sineonoff, Kaponoff & Co.	Agricultural machinery.	Metal shop.
Simpadoff		Metal shop.
<i>Plovdiv</i> Balkan (Illustra- tion VI - 10) Tzanoff Ambareff	Barbed wire, nails, bolts, clamps, RR parts, cast machine parts (?), nuts, and stoves.	
<i>Ruse</i> Jity S.A., Tarnovski Chosse 26 E. Muhlaupt & Co., Linniski Chosse 8 Iskovitch & Levy	Wire and wire goods.	Metal shop.
Fr. Grabovisky S.A., Rue Alexandrovsko Alexei Samfinoff, Rue Tz. Chickman 7	Iron furniture and beds.	Confirmation needed.
	Iron barrels.	Confirmation needed.
<i>Sofiya</i> Titania Orel, Kwartal Industrielle Globus, S.A. Gelesna Ruka		Metal shop. Metal shop. Metal shop. Metal shop.
<i>Stara-Zagora</i> Emia R. Assa	Beds.	Confirmation needed.
<i>Varna</i> Karlovag	Bridge spans up to 60 feet long; equipped to make motorparts; storage tanks, bolts, pins, and clamps.	RR connection. Also makes transport materials.
Voulcan S.A.		Metal shops.
<i>Vladaya</i> Staimenoff	Mica.	

(3) *Military equipment.* Production of military equipment consists primarily of manufacture of ammunition. Small arms and ordnance are only assembled and repaired, and perhaps some of their more elementary components are produced locally. There are three airplane assembly and repair shops (at Kazanlk, Lovech, and Bozhurishte near Sofiya). Table VI - 25 shows the location and type of work of arsenals and factories producing military equipment.



Illustration VI - 10. Metal shops of the Balkan Company.

Shops are in the foreground at railroad. Productive agricultural valley near Plovdiv in the Maritsa Basin. Exact location and date unknown.

TABLE VI - 25  
BULGARIA, PRODUCTION OF MILITARY EQUIPMENT

LOCATION	TYPE OF WORK	REMARKS
KARLOVO	Shell filling up to 155 mm.	800-1,000 workers and steel foundry reported.
KAZANLIK, 1 km. from depot	Artillery Section: Assembly of field guns, mountain guns, trench mortars from imported finished barrels and breech mechanisms. End 1939: mounting 75 mm. Krupp & Rheinmetall guns. Repair work. Small Arms & Machine Gun Section: Assembly and repair mainly. 1938: 150 bayonets and 100 gun stocks daily, 150 machine gun barrels monthly. Shell Section: Imports shell billets and fuses, and finishes, fills, and assembles shells up to 155 mm. 1938 cap: 2,000 rounds of 75 mm. shells and 65,000 rounds of small ammunition daily. Foundry: Boilers, water and steam piping, gears, small wagons, and wheels (1938). Reported to produce artillery tubes, bombs and hand grenades. Explosives Section: Cf. under Explosives. Also: Barbed wire, field kitchens, trailers, artillery wagons, camp and field equipment.	Factory expanded its activities since 1939. In 1938 production sections were run by military personnel. Total labor 6,000 (?) 6/41 on 24-hour basis. Now reported under German supervision. 1,000 workers reported engaged in ammunition manufacture.
BANYA-KOSTENETS, State factory	Shell filling up to 155 mm. and small arms ammunition.	
Near MEZDRA, Nikolshev factory	Semifinished goods for German army.	Fire reported in 3/42.
SHUMEN, State factory	Small arms ammunition and shell filling up to 105 mm.	
SOFIYA, State factory	Miscellaneous military equipment, such as army carts, field kitchens, etc. Also: Repair of wireless equipment and field phones.	
SOPOT, State Arsenal	Designed to produce 75 mm. and 20 mm. antiaircraft shells, hand grenades, and small arms ammunition. End 1939: ca. 5,000 rounds of small arms ammunition a day. Since 1940: Aerial bombs up to 50 kg.	Factory began production in 1939 without being fully completed.
VARNA, F. Zwicky A. G. (Swiss firm)	Small shot.	Running out of lead and iron (11/42).

#### B. Chemical and allied industries.

Bulgaria is very largely dependent on Germany for most of her chemical requirements. Only soap, alcohol, glue, and mint and rose oils are produced locally in sufficient quantity

to meet domestic needs (Figure VI - 1). There are about 270 chemical plants of all kinds, which employ roughly 2,500 workers. Since the outbreak of war numerous plans have been announced for the construction of plants to produce such

things as copper sulphate, caustic soda, sulphuric acid, oleum, fertilizers, turpentine and other wood distillation products, matches, and pharmaceuticals. It is unlikely that any of these projects are beyond the planning stage.

The classification of plants by products are:

(1) *Alcohol*. Plants are in Gorna Orekhovitsa, Mezdra, Ruse, and possibly in Vidin, Plovdiv, and Knyazhevo.

(2) *Ammonia*. There is a plant at Plachkovtsi.

(3) *Calcium carbide*. A plant is at Ilientsi.

(4) *Copper sulphate and other insecticides*. A copper sulphate plant is at Ruse.

(5) *Explosives*.

(a) *Kazanlk*. This government munitions plant in 1938 had a daily (8-hour) output of 600 kg. nitrocellulose, 400 kg. glycerin, 400 kg. cannon powder, and 400 kg. rifle powder.

(b) *Ruse*. The black powder and cordite plant at Ruse, known as the Prinz Boris works, is probably the only plant in Bulgaria which can produce smokeless powder for rifles.

(c) *Varna*. A small factory for producing such explosives as black powder, dynamite, etc., is near the village of Peinirdzhik, on the south shore of Lake Devna.

(d) *Other powder plants*. These are at Lipnik (near Ruse), Gabarevo and Sopot (both near Kazanlk), Nadezhda and Luzas (near Sofiya), Stokite (near Sevlievo), and at Gabrovo.

(6) *Fertilizer*. So far as is known, Bulgaria produces no chemical fertilizers, but some plants are projected. A serious shortage of fertilizers is reported.

(7) *Hydrochloric acid*. This plant is at Panagyurishte, NW of Plovdiv.

(8) *Leather*. There is an acute shortage of leather and of tanning materials. Even in normal times Bulgaria's 60 or 70 leather goods plants produced only about one-third of domestic needs. In 1936 there were no modern shoe plants in the country. Tanneries are in Sofiya, Ruse (2 plants), Varna, and Gabrovo (9 plants). There are two leather goods factories in Sofiya near the tannery.

(9) *Matches*. A. G. Kostenets, Bulgaria's only important match factory, is at Kostenets. Its output does not completely meet domestic demands and large quantities of matches were recently imported from Italy and Finland. The Government plans to erect a large modern plant, probably at Kostenets, which would make up the present local deficiency and provide an exportable surplus.

(10) *Paint, varnish, lacquer, etc.* There are plants in Sofiya and Ruse (2 plants).

(11) *Paper*. The consumption of paper has been cut 50 per cent. A shortage of resin is said to be restricting production. There are plants at Iskr and Dolna Banya (both near Sofiya), Kostenets, and Beleva.

(12) *Pharmaceuticals*. Supplies of insulin and quinine are insufficient. The country produces an undetermined but small amount of raw opium. There are two plants for the production of alkaloids in Sofiya. A modern drying plant was erected near Sofiya in 1941 for processing rose hips, a rich source of Vitamin C. In 1940 Bulgaria exported enough raw material to supply the Vitamin C requirements of 10

million people. Germany took more than 75 per cent of the 6.9 million kg. of medicinal herbs exported by Bulgaria in 1942.

(13) *Rubber*. Bulgaria formerly imported 600 to 800 MT of rubber per year which were used primarily in the manufacture of footwear. The domestic rubber goods industry is very small and cannot supply all domestic requirements. Since the outbreak of war Bulgaria has attempted to make up its deficiency by cultivation of milkweed and by synthetic production. An experimental synthetic plant in or near Sofiya is producing at the rate of 20-25 MT per year. A larger plant, which will have an annual output of 500 to 600 MT, is being, or will be, built.

The most important rubber goods factory is H. Bakish, Gummiwarenfabrik, in the suburb of Nadezhda, Sofiya. It employed 500 to 700 workers before the war, but employment in March 1943 was only 100. Prior to the war, the plant produced about 1,500 tires per year and considerable quantities of footwear. Early in 1942 the plant began to work exclusively for the military authorities, producing automobile and aircraft tires. One report puts daily production at 15 to 20 tires, while another report states that daily production is 50 to 60 tires.

Other rubber goods factories are located at Sofiya (three plants), Pazardzhik (three plants), and Ruse (two plants).

(14) *Soap*. Bulgaria is reportedly self-sufficient in soap. The largest plant is located in Kostinbrod, with other plants in Ruse (two plants), Varna, and Plovdiv.

### C. Textiles.

The Bulgarian textile industry comprises 360 plants employing more than 32,000 workers and is, therefore, the largest industry, in terms of employment, in the country. The majority of the mills are in Sofiya, Gabrovo, and Sliven, with a number of important plants in other cities. Although the country produces an important share of the raw materials required by the textile industry, many plants have been closed because of a shortage of raw materials. In 1938 Bulgaria produced 4,410 MT of hemp, flax, and jute and in 1939 nearly 11,000 MT of wool and 10,000 MT of cotton. Cotton production in 1939 equalled 30 to 40 per cent of domestic cotton requirements.

Textile plants are reported in the following places.

(1) *Gabrovo*. There are at least 21 textile mills; ten are engaged in wool spinning or wool cloth manufacture.

(2) *Sliven*. There are at least eight important woolen mills in or near the town.

(3) *Sofiya*. There are at least 19 textile plants in Sofiya, which can be classified as follows: four woolen mills, six cotton mills, five silk mills, four knit-goods mills.

(4) *Varna*. There are at least three textile plants in Varna. Cotton, jute, and flax are processed.

(5) *Kazanlk*. There are at least three textile mills in Kazanlk. Wool and silk are processed.

(6) *Other towns*. There are at least five firms in Ruse, processing cotton, silk, linen, and hemp; one cotton mill each in Provadiya and Yambol; one silk mill each in Karlovo and Vratsa; one important thread factory in Trnovo; a woolen mill in Kyustendil, reported to be the largest in Bulgaria;



one hemp mill in Bela Slatina; one linen factory in Pleven, and one rope factory in Plovdiv.

#### D. Building materials.

(1) *Glass.* There is a large glass factory near Pernik; another at Sindel, a town WSW of Varna.

(2) *Brick.* Bulgaria has 144 brick factories, employing 3,100 workers. There are two plants near Plovdiv, several small plants near Burgaz, and a plant at each of the following: Plovdiv, Pazardzhik, Vidin, Popovo, Pleven, Dolni Bogrov (Doli Bogoroff), Cherven-Breg, Sofiya, Batanovtsi, Reka Devna (Selo/Rekedevna), Yambol, and Ruse.

(3) *Tile.* Novoseltsi and Radomir each have a tile factory.

(4) *Cement.* Bulgaria normally produces enough cement to fill domestic requirements. But because of the vastly increased war-time demands there is now an acute shortage. All production is believed to be allocated to fortifications and other military installations and in addition attempts have been made to import large quantities.

Plants are located in the following places.

(a) *Batanovtsi.* The Granitoid Co. is the largest single industrial undertaking in Bulgaria; 2,000 workers are employed in the quarries and 1,000 in the factory. The plant accounts for almost the entire domestic production of cement (estimated at 190,000 tons in 1943).

(b) *Pleven.* The capacity of the Lev cement works is estimated at 15,000 tons in 1942.

(c) *Cherven-Breg.* A plant is being constructed at Cherven-Breg and is expected to come into production by 1944. It is to be equipped with machinery from the Copenhagen works of Schmidt & Company. The annual capacity is estimated at 120,000 MT.

(d) *Rakovski.* The Granitoid Company has a new plant under construction at Rakovski. It is believed that at least part of the building has been completed and that the necessary machinery is shortly to be supplied by Germany.

## 66. Food Resources

### A. Agriculture.

(1) *General characteristics.* Bulgaria is primarily agricultural, 80 per cent of the working population being engaged in agriculture, with some of the remainder in directly related occupations.

Until about ten years ago, Bulgarian agriculture was of a primitive subsistence type with grain the only important surplus. Since then, Bulgaria has diversified its agriculture and now has a surplus of specialty crops as well as grain, which was further increased by annexation of grain-surplus areas in 1941 (Table VI - 26). German demands for tobacco, potatoes, vegetables, and oilseeds are so pressing that the Bulgarians are expanding the acreage of these at the expense of cereals.

The principal food surpluses in 1942 were grain, oilseeds, tobacco, fruit pulp and jam, fresh fruit (largely table grapes), vegetables, eggs, and cheese. Most of these are exported to Germany, as they have been for a number of years.

There are three major types of land in Bulgaria (Figure VI - 3). About a quarter of the country is in woodland, confined almost exclusively to the upper elevations of the

two main east-west mountain ranges. Over a third is in scattered patches of pasture and wasteland, commonly located on the lower slopes of the mountains where soils are thin, the terrain very broken, or rainfall meager (Illustrations VI - 11 and VI - 12). Less than a third is actually tilled in any one year. The tilled land lies primarily in the broad Danubian Tablelands south of the Danube River, the Maritsa Basin, small alluvial valleys along the smaller rivers, and the mountain foothills.

TABLE VI - 26  
PRE-WAR AND 1942 PRODUCTION AND TRADE IN  
FOODSTUFFS, BULGARIA (IN METRIC TONS)

	PRE-WAR—OLD BULGARIA PRODUCTION 1936-40	NET EXPORTS	1942—GREATER BULGARIA PRODUCTION	NET EXPORTS
<i>Grain</i> .....	3,413,300	252,141	3,771,000	175,000
Wheat.....	1,823,700	173,275	2,000,000	100,000
Rye.....	209,800	2,890	175,000	
Barley.....	336,900	9,770		
Oats.....	126,200	880	1,600,000	75,000
Corn.....	856,700	65,730		
Rice.....	21,300	neg.	45,000	10,000
Potatoes.....	109,000	730	500,000	
<i>Oilseeds</i> .....	180,000	11,370	258,000	100,000
Rapeseed.....	16,100	3,960	20,000	
Soybeans.....	13,700	8,190	60,000	46,665
Groundnuts.....	2,333			
Sesame.....	1,467	820	5,000	
Sunflower seed.....	147,500	42,400	160,000	45,000
Castor seed.....	neg.	none	13,000	3,000
<i>Olive Oil</i> .....	none	none	770	
<i>Vegetables</i> .....	284,171	13,120	325,000	26,000
Dry beans.....	41,500	-12,660		
Tomatoes.....	49,500			
Onions.....	42,900	860		
Peas.....	1,500			
Other.....	148,775			
<i>Fruit</i> .....	296,000		350,000	40,000
Oranges and mandarins.....		-1,735 <sup>1</sup>		
Lemons.....		-1,210 <sup>1</sup>		
Apples.....	18,200	6,830		
Grapes (not used for wine).....	173,300	41,820	200,000	30,000
Plums.....	80,000		120,000	10,000
Olives.....	none			
Strawberries.....	8,400			
Other.....	16,100			
<i>Fruit products (pulp, jam)</i> <sup>2</sup> .....			164,000	120,000
Wine.....	150,300	4,870	170,000	40,000
Sugar (raw).....	26,000	-3,915 <sup>1</sup>	34,000	-10,000 <sup>1</sup>
Coffee.....		-545 <sup>1</sup>		
Cocoa.....		-730 <sup>1</sup>		
Milk (liquid consumption).....	300,000	neg.	450,000	
Butter.....	6,000	neg.	10,000	
Cheese.....	30,000	1,393	50,000	
Eggs.....	33,000	16,254	39,700	16,000
<i>Meats</i> .....	200,000	not available	305,000	20,000
Beef.....	60,000		80,000	
Pork.....	65,000		80,000	
Mutton and lamb.....	150,000		200,000	
Other.....	20,000		35,000	
Lard.....	16,000		20,000	
Fish.....	5,200		7,500	
Tobacco.....	38,770	27,605	60,000	41,700

<sup>1</sup>Net import.

<sup>2</sup>Fruit and sugar content of fruit products have not been eliminated from fruit and sugar production data.

Most farm-holdings in Bulgaria are small, being seldom larger than 10 or 12 acres. Usually one farm family cultivates a number of detached, scattered fields, some of which are as far as several miles from the owner's house. As a rule, peasants own their land and dwellings, but have few implements to work their farms. Some threshing machines and grain drills are owned by cooperatives or by the state. Horses and oxen are the most common source of farm power. In supply of food, the average farm is largely self-sufficient.

The principal grains, wheat and maize (corn), occupy more than half of Bulgaria's arable land. Wheat is about twice as important as maize in area and production. The chief wheat-

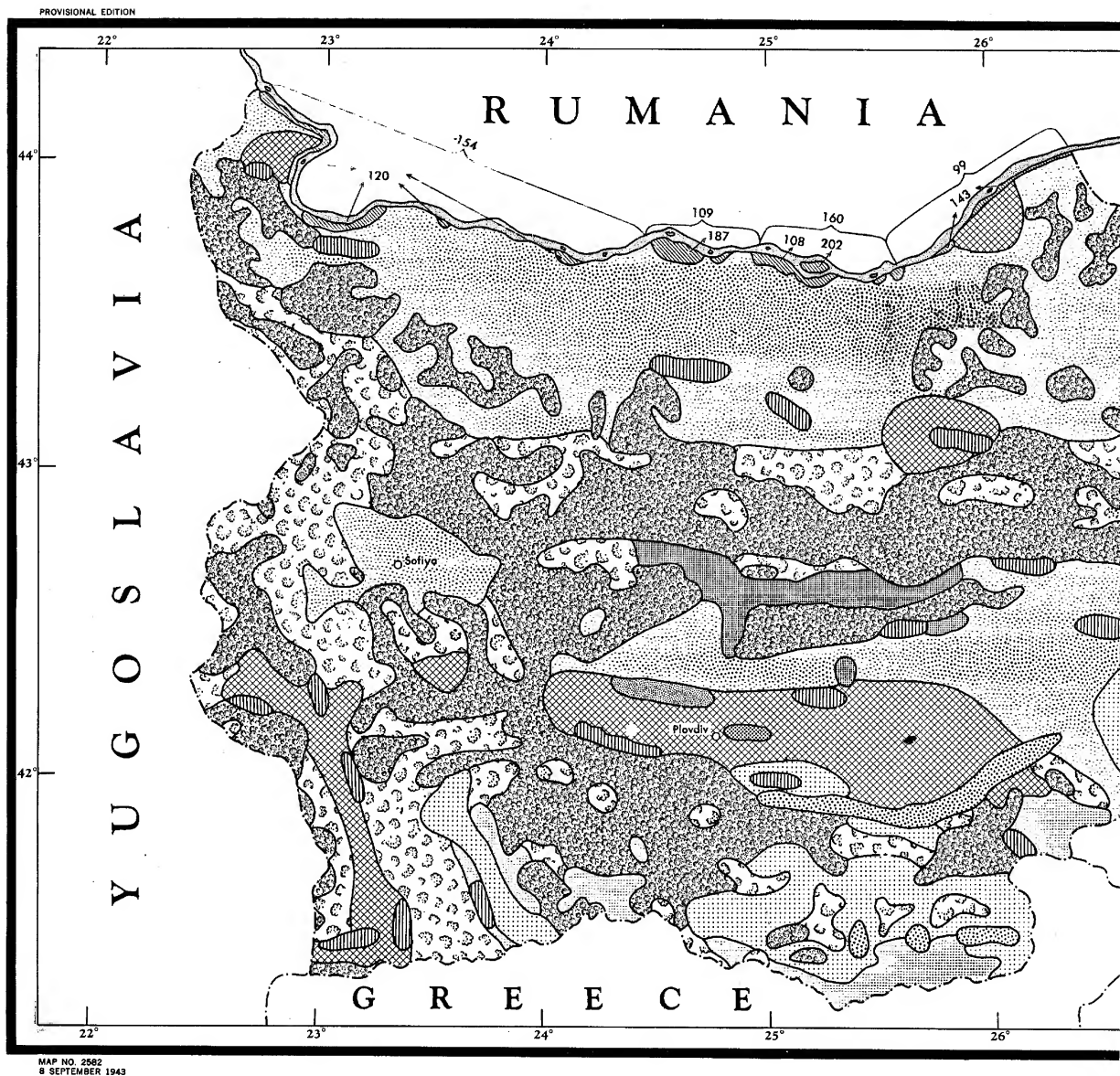
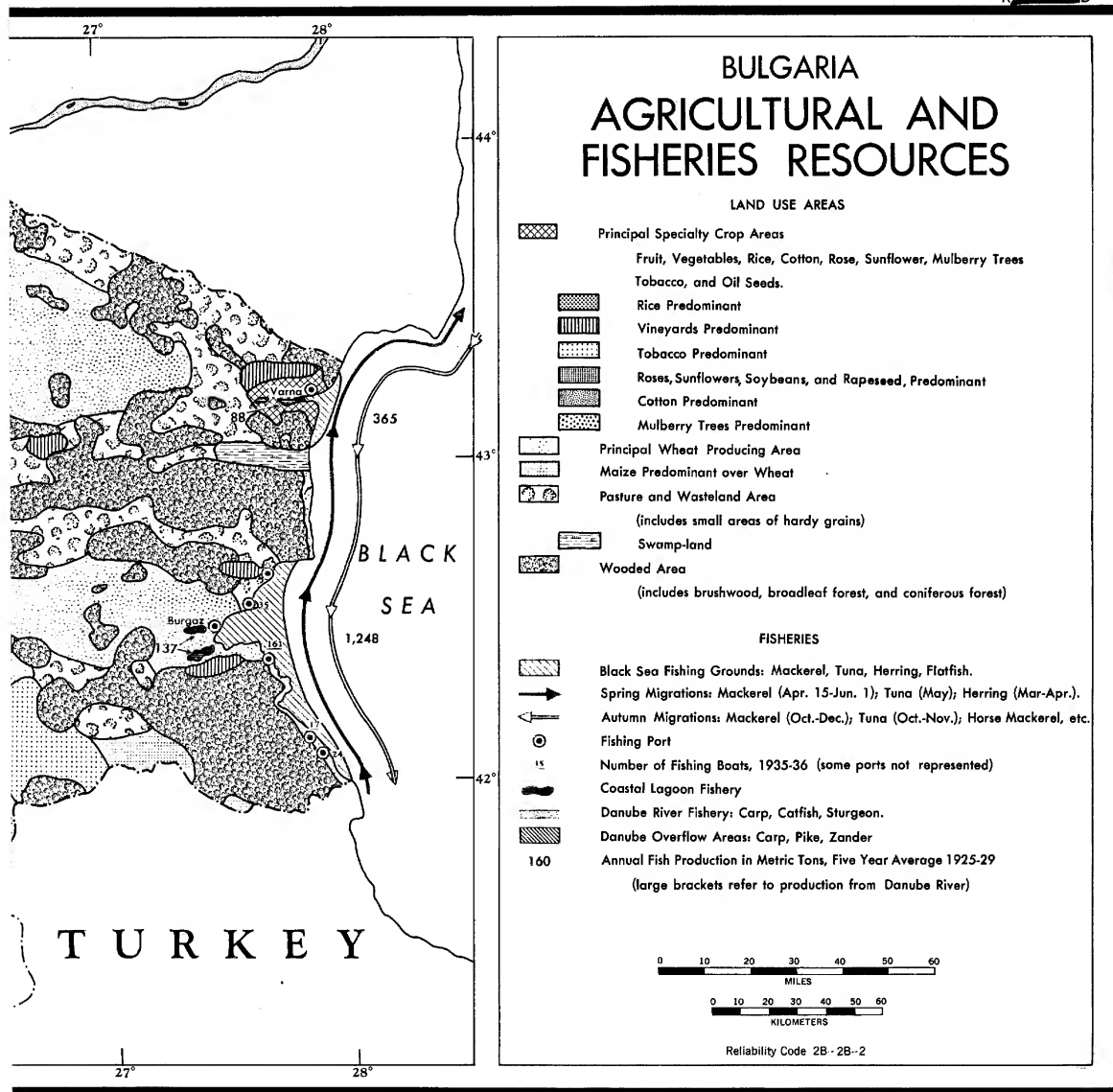


Figure VI-3  
JANIS NO. 38



COMPILED AND DRAWN IN THE BRANCH OF RESEARCH AND ANALYSIS, OSS  
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*Illustration VI - 11. Landscape near Plovdiv.*  
Panorama of Zlatograd to show the cultivation on lower mountain slopes.



*Illustration VI - 12. Farms in the Sofiya Basin.*  
Aerial view of the scattered, intensively cultivated small farms.

producing areas are the Danubian Tablelands, between the Danube River and the Stara-Planina, and the Maritsa Basin (Illustration VI - 13). Corn occupies some of the more moist land within these regions, predominating over wheat in parts of the warmer Maritsa Basin.

Scattered throughout the country are small specialty-crop areas. Except for mulberry groves and vineyards, which are found on the hillsides, specialty crops are generally located on the better soils of the river valleys. Small vineyards are found throughout the country. One mulberry-producing section lies in south-central Bulgaria where temperatures are relatively high. Tobacco is found in several parts of southern Bulgaria, and in Grecian Thrace. The rose and sunflower area is in the alluvial valley of the Tundzha River, extending in an east-west direction from about 20 miles east of Kazanlk to 20 miles west of Karlovo. Rice is produced only in one very small section just east of Plovdiv on the flood plain of the Maritsa River.

Harvest periods for certain important crops are shown in Table VI - 27.

TABLE VI - 27  
BULGARIA, HARVEST PERIOD OF CROPS

CROP	PERIOD
Wheat.....	Late June to early August
Corn.....	June—July
Other cereals.....	June—July
Sugarbeets.....	October—November
Potatoes.....	September—October
Table grapes.....	Late August—early November
Wine grapes.....	September—October
Tobacco.....	August—November

## (2) Production.

(a) *Grain.* Bulgaria, normally a grain-surplus country, exported an average of over 250,000 MT a year from 1936 to 1939. Almost 175,000 tons of this was wheat.

During the past decade much grain acreage has been changed to specialty crops. At the same time, greater yield per acre has resulted from increased mechanization of grain production, the introduction of commercial fertilizer, and rotation of grain with soybeans.

In 1941, Bulgaria annexed the important grain-surplus areas of southern Dobrogea, Greek Thrace and western Macedonia, and the Serbian Vardar Valley which has a small grain deficit because of its relatively large numbers of livestock.

With the increased yields per acre and the annexed grain acreage, despite a drought in 1942, the surplus of expanded Bulgaria in 1942 is estimated at between 350,000 and 375,000 MT. About 175,000 tons of this was exported, and about 200,000 was probably hoarded by local communities and the peasants. If the 1943 harvest is as favorable as reports indicate, there should be a surplus of 250,000 to 300,000 MT of bread-grain alone (wheat and rye). There will also be greater consumption in grain-shortage areas (largely urban).

(b) *Rice.* Rice production in old Bulgaria is rather small. Acquisition of some 4,000 hectares of rice land in Thrace-Macedonia created a surplus above total Bulgarian needs of 10,000 MT in 1942.

(c) *Vegetable oils.* Bulgarian farmers have been increasing their soybean acreage for the past decade, both because the increased European demand for edible oil resulted in high prices, and because farmers discovered that a rotation of

soybeans on their wheat lands increased wheat yields. Of the 60,000 MT produced in 1942, almost 47,000 MT were exported.

Bulgaria has always been an important exporter of sunflower seeds, and has acquired new sunflower-growing territory in Dobrogea. Of 160,000 MT produced in 1942, 45,000 MT were exported.

Acreage of both rapeseed and castorseed has expanded but the total output and surpluses are still rather small.

Some olive groves were acquired in the territory taken from Greece in 1941, but the 1942 production was very small, yielding about 770 MT of oil. The crop harvested early in 1943 was reported to have yielded 1,300 MT of oil.

(d) *Potatoes.* Potato acreage and production were substantially expanded in 1942. Old Bulgaria produced an average of 109,000 MT between 1936 and 1940; the newly acquired territories produced less than 50,000 MT during the same period. Total 1942 production in greater Bulgaria was reported as 500,000 MT. After the harvest, there were reports that 300,000 tons of this had been set aside for conversion into flour to be mixed with wheat flour for bread, but difficulties in milling the potatoes seem to have caused almost complete abandonment of this plan.

(e) *Vegetables.* Bulgarians are fine gardeners, and almost every family has a vegetable garden, but commercial production is not very well developed. Total exports of vegetables in 1942 were 26,000 MT. Dried kidney beans were formerly the only outstanding vegetable export but during the past decade tomatoes have become important. The canning industry has been expanded with German encouragement, but is still very small. Some 14,000 MT of vegetables were canned in 1942.

(f) *Fruit.* Bulgaria is an important producer of grapes and has always had a large annual surplus. Additional vineyards were acquired through annexation of Skoplje, Bitolj, and Greek Macedonia. The bulk of the grapes are converted into wine, but substantial quantities are eaten as fruit or manufactured into jam. 1942 exports included some 30,000 MT of grape jam, 35,000 MT of grape pulp, and 35,000 MT of table grapes.

Plums are the only other important fruit grown. Production is reported to have expanded from some 80,000 MT before the war to 120,000 MT in 1942. In 1942 about 10,000 MT were exported.

Most of the fruit export of 1942, some 91,000 MT in all, was in the form of fruit pulp: 40,000 MT of strawberry pulp, 16,000 MT of apple pulp, as well as the 35,000 MT of grape pulp.

The fruit-canning industry is very small with less than 25,000 MT of fruit canned in 1942.

Bulgaria produces no citrus fruit, but normally imported some 3,000 MT before the war.

(g) *Wine.* Although Bulgaria secured greater acreage of vineyards through annexation, wine exports were so increased in 1942 that the people of Greater Bulgaria had less wine than the population of old Bulgaria before the war.

(h) *Sugar.* Sugar has become very scarce in Bulgaria during the war. Normally a net importer of about 4,000 MT a year, Bulgaria imported 10,000 MT in 1942 from the Protectorate (Bohemia-Moravia) and asked for 25,000 more. This increased demand was due to the annexation of sugar-deficit areas, and increased wartime demand by individuals and by the expanded preserving industry.



*Illustration VI - 13. Mountain farm near Vrattsia.*  
Typical farm in the northern foothills of the Stara-Planina, in the Iskr River section.



(i) *Dairy products.* Bulgarian cattle are mostly all-purpose animals, being used for milk, meat, and draught purposes (Table VI - 28). The milk yield per cow is very low, although cattle of the newly acquired territory (especially in the Vardar area seized from Yugoslavia) had a higher milk yield per cow than those of old Bulgaria. Milk is also obtained from ewes, water buffaloes, and goats.

TABLE VI - 28  
BULGARIA, LIVESTOCK NUMBERS, PRE-WAR AND 1942

	PRE-WAR OLD BULGARIA	1942 GREATER BULGARIA
Cattle.....	1,497,600	2,300,000
Pigs.....	902,000	1,140,000
Sheep.....	8,839,500	12,600,000
Goats.....	913,100	2,050,000
Poultry.....	11,813,600	18,200,000
Horses.....	506,100	
Asses.....	180,700	
Mules.....	36,600	
Buffalo.....	375,000	

There has been a large increase in cheese production. There probably were some cheese exports in 1942, but there were no substantiating reports. Butter consumption is small. Both cheese and butter are produced chiefly in small cooperative creameries in the villages for local consumption. Pre-war factory production of butter was only 650 MT a year or about one-tenth of the urban and village creameries' production.

There is probably no surplus of either milk or butter, and, due to increased local consumption, only a small quantity of cheese.

(j) *Eggs.* Increase in the number of poultry (largely due to annexation) has not brought about a corresponding increase in egg production. This may be the result partly of shortage of feedstuffs caused by the 1942 drought, and partly of hoarding by local communities and peasants. In 1942, exports of 16,000 MT of eggs from all of Greater Bulgaria were about the same as the average for pre-war Bulgaria.

(k) *Meats.* Mutton and lamb are Bulgaria's principal kinds of meat. In the pre-war period (Table VI - 26), only 25 per cent of the beef (15,000 MT), 14 per cent of the pork (9,000 MT), and 10 per cent of the lamb and mutton (14,000 MT) were slaughtered in towns. Most meat slaughtered in rural areas is nearly impossible to requisition. The supply of meat available to urban areas is too small to permit a surplus for occupying forces.

(l) *Lard.* Lard production in 1942 is estimated at 20,000 MT, 4,000 MT above the average pre-war production of old Bulgaria. The government ordered official purchase and storage of 4,000 MT of lard during the past year, and if this amount was actually acquired it might be available to occupying forces.

(m) *Tobacco.* Bulgarian tobacco-growing is centered in the southern part of the country. After annexation of Greek tobacco lands in Thrace, Bulgaria became the most important tobacco-surplus area of Europe. With German encouragement, tobacco production has been expanded even further. As a result, the crop harvested in Greater Bulgaria at the end of 1942 was reported to total 64,300 MT, compared with an average pre-war production in old Bulgaria of 38,770 MT. The planned allocation of the 1942 crop (which will be distributed in 1943) has been reported as follows: to Germany 42,000 MT; to Italy 3,500 MT; to other countries 5,500 MT; domestic consumption 9,000 MT; and in reserve 4,300 MT.

(3) *Processing facilities.* Commercial food processing in Bulgaria is poorly developed (Figure VI - 4). Canning of foods was not introduced until 1935. The leading cities contain some canneries, flour mills, and slaughterhouses which serve the urban population. The peasants usually do most of their own slaughtering, distilling, milling, and preserving of food in their homes and in small village establishments.

(a) *Flour mills.* There are thousands of small community flour mills and over 100 larger commercial ones. Several thousand of the smaller mills have been closed in recent years. Most of these were closed since the war in order to prevent loss of flour to the black market. The large mills are considered capable of grinding all the flour needed by the domestic market.

(b) *Sugar factories.* In 1932, annual capacity of Bulgaria's sugar factories was as follows (in metric tons):

Gorna Orekhovitsa.....	16,000
Krdzhali.....	5,000
Burgaz.....	5,000
Pleven.....	40,000
Ruse.....	30,000
Sofiya.....	9,000
Plovdiv.....	8,000

(c) *Tobacco and cigarette factories (1939).* Most of the 26 tobacco factories listed in Figure VI - 4 are small, but two at Plovdiv and one at Varna produce large quantities of smoking tobacco and cigarettes.

(d) *Fruit and vegetable preserving.* Several thousand small home industries are engaged in canning and drying vegetables and fruit. Before the war there were few commercial canneries (Figure VI - 4). However, a number of reports indicate that there has been extensive expansion of vegetable canneries and drying, freezing, and storage plants. Production in 1942 was reported to be 24,000 MT of fruit and 14,000 MT of vegetables, as well as 2,000 MT of meat and fish. Early in 1943, the Germans were reported to be building more canneries and cold storage plants.

This expansion of commercial preserving facilities is the result of efforts to cut down on transport space and deterioration of fruit and vegetables previously shipped to Germany in fresh form.

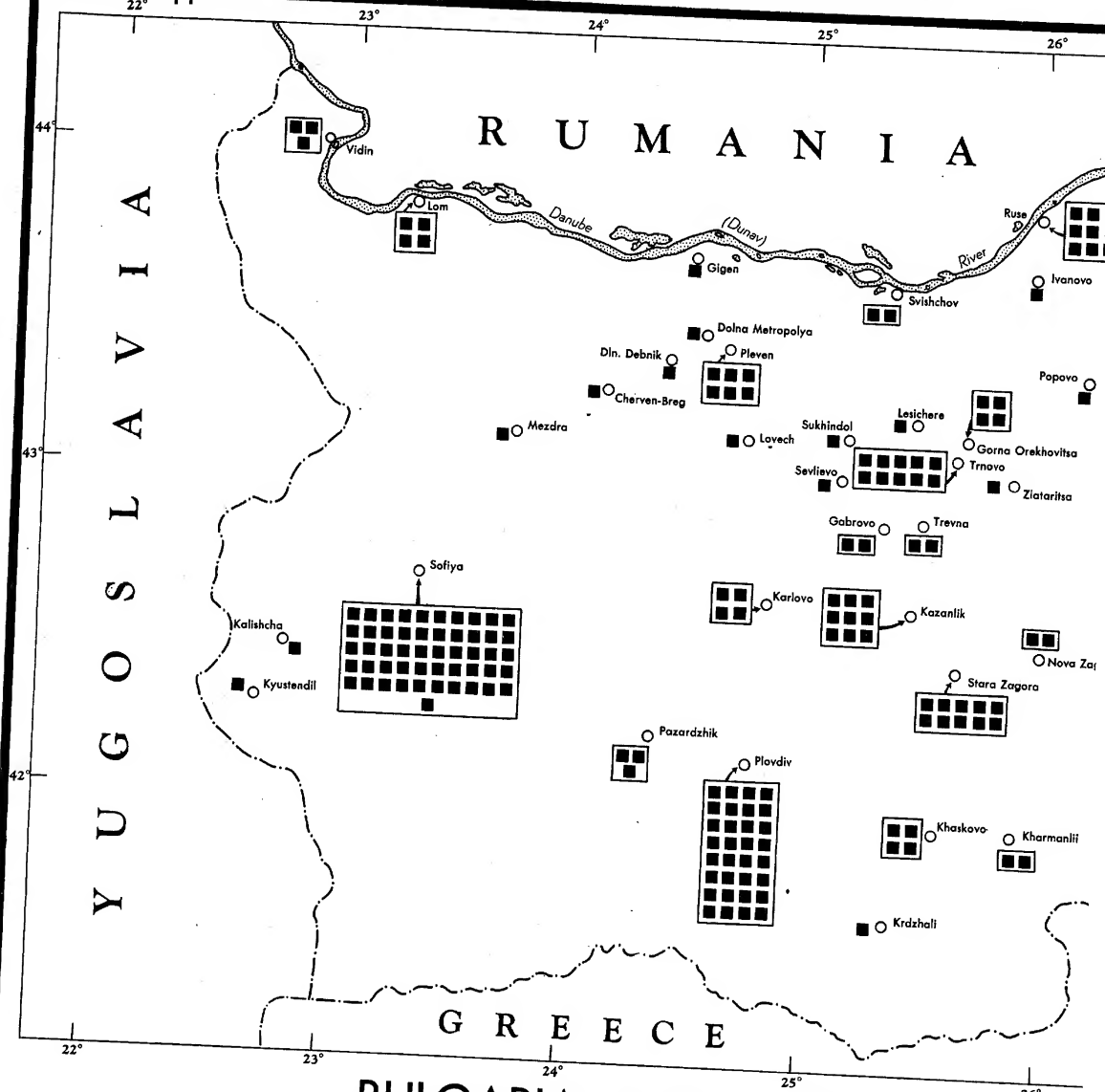
(e) *Breweries, distilleries and wineries.* Location of five breweries, 15 distilleries and 31 wineries in 1939 is indicated in Figure VI - 4. The wineries in 1942 are reported to have converted 300,000 MT of grapes into 18,000,000 liters of wine. Output of the breweries was as follows (1939):

Plovdiv.....	1,271,450 liters per annum
Shumen.....	4,640,800 liters per annum
Sofiya (2).....	2,753,600 liters per annum
Trnovo.....	2,074,000 liters per annum
Total.....	10,739,850 liters per annum

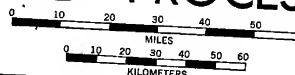
(f) *Vegetable oil plants.* The vegetable oil industry, which comprised over a dozen plants in 1931, has recently taken over nearly a score of small rose-oil distilleries and converted them to vegetable-oil refining for the domestic and German market.

(g) *Slaughterhouses and meat-processing plants.* There are slaughterhouses in the principal towns, and also several sausage factories.

(4) *Food consumption and rationing.* It is estimated that the average Bulgarian consumes almost 90 per cent of his



## BULGARIA: FOOD PROCESSING



ONE PROCESSING PLANT	Burgaz	Cherven-Breg	Din. Debnik	Dolna Metropolya	Drafta	Gabravo	Gigen	Gorna Orekhovitsa	Ivanovo	Kalishcha	Karlovo	Karnabat	Kazanlik	Kharmanlii	Khaskovo	Krdzhali	Kyustendil	Lesichere	Lom	Lovch	Mezdra	Nova Zagora	Pazardzhik	Pleven	Plovdiv	Popovo
Flour Mill																										
Rice Mill																										
Starch, Dextrin, or Glucose																										
Sugar Refinery																										
Distillery																										
Cannery																										
Fruit Preserves																										
Vegetable Oil																										
Tobacco Factory																										
Rose Attar Distillery																										
Cold Storage and Ice Mfg.																										
Slaughterhouse																										
Meat Packing																										
Dairy																										
Fish Cannery																										
Fish Oil and Fish Meal																										



[illegible]

pre-war diet, or 3666 calories per day. The protein, fat, and carbohydrate content of his diet are all adequate, amounting to over 80 per cent of pre-war consumption (Tables VI-29 and VI-30).

TABLE VI - 29  
BULGARIA, DAILY CONSUMPTION OF VARIOUS FOOD-  
STUFFS BY AVERAGE CONSUMER (PRE-WAR AND 1942)

	PRE-WAR (GRAMS)	1942
Wheat flour.....	548	432
Rye flour.....	68	44
Barley, oats, corn.....	132	110
Rice.....	8	11
Potatoes.....	38	129
Oil (from seeds).....	14	11
Vegetables.....	99	77
Fruit.....	110	99
Milk.....	132	162
Butter.....	3	3
Cheese.....	14	16
Eggs.....	8	8
Sugar (unprocessed).....	14	14
Wine.....	63	41
Lard.....	8	5
Fish.....	3	3
Meat.....	129	112
	1,391	1,277

TABLE VI - 30  
BULGARIA, NUTRITIVE VALUE OF AVERAGE DIET<sup>1</sup>

	CALORIES	PROTEINS	FATS	CARBO- HYDRATES
Pre-war.....	3,666	138	72	628
War (1942-43).....	3,212	117	61	511
Per cent of pre-war.....	88	85	85	85

However, these generalizations hide the variation in food consumption that exists among different groups of the population (Table VI-31). Although some of their dietary habits have shifted, most rural Bulgarians, 80 per cent of the population, have almost as much food as in pre-war years, since it is almost impossible to limit the food supply of producers. Although there has been an attempt to limit the amount of grain that peasants may retain, they are adept at hoarding, not only for their own needs but for sale through the black markets in the cities.

Most urban consumers are less well-off than their rural countrymen. The rationing system, applied only to the city and town populations (roughly 1,700,000 people), was introduced in October 1940. This was later than in most European countries because of the high degree of self-sufficiency in food production of the country as a whole. The ration includes almost all the major food commodities, but varies with the type of consumer.

TABLE VI - 31  
BULGARIA, NUTRITIVE VALUE OF URBAN AND  
RURAL DIETS

URBAN	CALORIES	PROTEINS	FATS	CARBO- HYDRATES
Normal consumer <sup>2</sup> .....	1,588	76	66	274
Heavy worker <sup>2</sup> .....	2,284	100	72	411
Very heavy worker <sup>2</sup> .....	2,618	112	74	480
Rural.....	3,594	127	60	566

<sup>1</sup>Based upon estimates of present supplies and upon an estimated population (1943) of 8,500,000.

<sup>2</sup>Based upon legal food rations for June, 1943 as outlined in Ministry of Economic Warfare, *Average Weekly Food Rations in Enemy and Enemy Occupied Countries*, June 21, 1943.

Different food allowances are made to five groups: children under one, children from one to five years of age, normal consumers, heavy workers, and very heavy workers. Children, who receive supplemental milk rations, are probably receiving an adequate diet. All adult consumers receive about two-thirds of their caloric requirements, if it is assumed that rations are available. However, full rations are not always available through legal markets. Low-income consumers who cannot afford black market prices and cannot secure food from country relatives or friends have less food than legal rations permit.

Bread has always formed a staple food for the Bulgarian consumer, and the most important wartime change in the diet has been the decrease in bread consumption and the decline in quality. As yet there are no reports of wide-spread disease or deterioration of health due directly to food conditions.

The amount of food surplus available to occupying forces would depend on the methods of food collection. At present the Bulgarian peasantry has undoubtedly hoarded substantial stocks of food for a number of reasons: dislike for government requisitioning; fear of further requisitioning by the armed forces; and ease of sale at high prices in the black markets of the cities. Most peasants would be willing to sell their produce at fixed prices if it were possible to secure farm equipment and other manufactured goods.

If such psychological factors could be overcome by the occupying forces, large stocks of food would undoubtedly be released for the market.

#### (5) Special problems.

(a) *Agricultural machinery.* Bulgarian agriculture has been in the process of mechanization for a decade. Larger farm machinery, owned either by local cooperatives or by the state, is shared by groups of farmers. A list of Bulgarian agricultural machinery is shown in Table VI-32.

TABLE VI - 32  
BULGARIA, AGRICULTURAL MACHINERY

MACHINERY	REQUIREMENTS	PRESENT EQUIPMENT	DEFICIT
Plows.....	600,000	370,480	229,520
Harrows.....	500,000	41,760	458,240
Cultivators.....	300,000	5,614	294,386
Rollers.....	200,000	3,500	196,500
Sowing machines.....	40,000	7,131	32,869
Seed-sorting machines.....	10,000	7,370	2,630
Mowing machines.....	45,000	7,829	37,171

Numbers of machines listed in the deficit column are not required to meet present production levels, but indicate the number required to raise production to the level of German demands. Provision of new farm equipment would be one of the best methods of increasing surpluses available to occupying forces.

(b) *Fertilizer.* Additional fertilizer can substantially increase production of the specialty crops (fruit, vegetables, wine, tobacco). Although only 1,572 MT of fertilizer were imported in 1939, the Germans shipped in some 18,000 MT during the 1942-43 crop year in an attempt to increase the surplus output of these crops. This included 10,000 MT of ammonium sulphate and 3,000 MT of calcium nitrate.

(c) *Food processing.* Although the processing industry

is being rapidly expanded, there is evidence that the existing capacity is not being fully utilized due to shortages of packaging materials. Since domestic consumption of preserved foods is essentially nil, the importation of both equipment and containers would be based on the need of obtaining processed foods for military forces.

(d) *Food shortages.* Food shortages reported from Bulgaria usually apply only to the largest cities; they are temporary and are restricted to individual types of foodstuffs. Hoarding by the peasants and use of transportation facilities by the military are the essential causes.

In event of occupation, the principal imports are estimated at 10,000 to 20,000 MT of sugar per year, and 2,000 MT a year of coffee, tea, and cocoa. Some quantities of foodstuffs would be required for urban populations whose food supplies might be temporarily cut off as a result of the breakdown of the food-distribution system.

#### B. Fish.

The total Bulgarian fish catch in the pre-war period was between 5,000 and 5,500 tons (Table VI - 33). Of this, about 3,500 tons came from the Black Sea coast and the coastal lagoons, 1,000 to 1,500 tons from the Danube River and its overflow areas, and about 500 tons from other inland rivers and streams. In addition, some 1,000 to 2,200 tons of fish, in about equal proportions of salted and fresh, came from Turkey.

Reports indicate that there may have been some increase in fishing during the war period, one source indicating a catch of over 5,000 tons in the Black Sea region alone in 1940.

Most coastal fishing is done within 3 miles of shore, from small boats. (See Figure VI - 3.) The low Bulgarian production is due largely to scarcity of fish.

Most fish are marketed fresh, chiefly in the immediate vicinity of the landings because of poor rapid transport facilities. Fish reach Burgaz from ports on the Gulf, and from Tsarevo and Akhtopol. Sofiya, Plovdiv, Trnovo, Gabrovo and Stara-Zagora are supplied with Danube fish. Refrigeration of fresh fish in transit is mainly by packing in ice,

supplies of which are inadequate in summer and autumn. Cold storage and refrigerator car facilities are insufficient.

## 67. Water Supply

### A. General characteristics.

Forces of occupation would ordinarily find adequate supplies of water, except in parts of the north and east. Although many springs have safe water, all water should be treated unless its safety is proved by testing. All well water must be considered unsafe.

(1) *Character of sources.* Bulgaria may be divided into two distinct regions of water availability. The first region, including the Stara-Planina (Balkan Mountains) and all of Bulgaria to the south, is adequately supplied, except near Burgaz. This region encompasses approximately two-thirds of the total area of the country. The second region, the Danubian Tablelands (North of the Stara-Planina), is characterized by acute water scarcity, especially during the dry summer season.

#### (a) Region I.

1. Mountains. The Rodopi Planina and Stara-Planina, with adequate precipitation and many perennial streams, are excellent watersheds for central and southern Bulgaria. Some streams are dammed, and distant cities are supplied mountain water by aqueducts. Shallow water tables occur chiefly in the alluvial-filled basins and upland valleys.

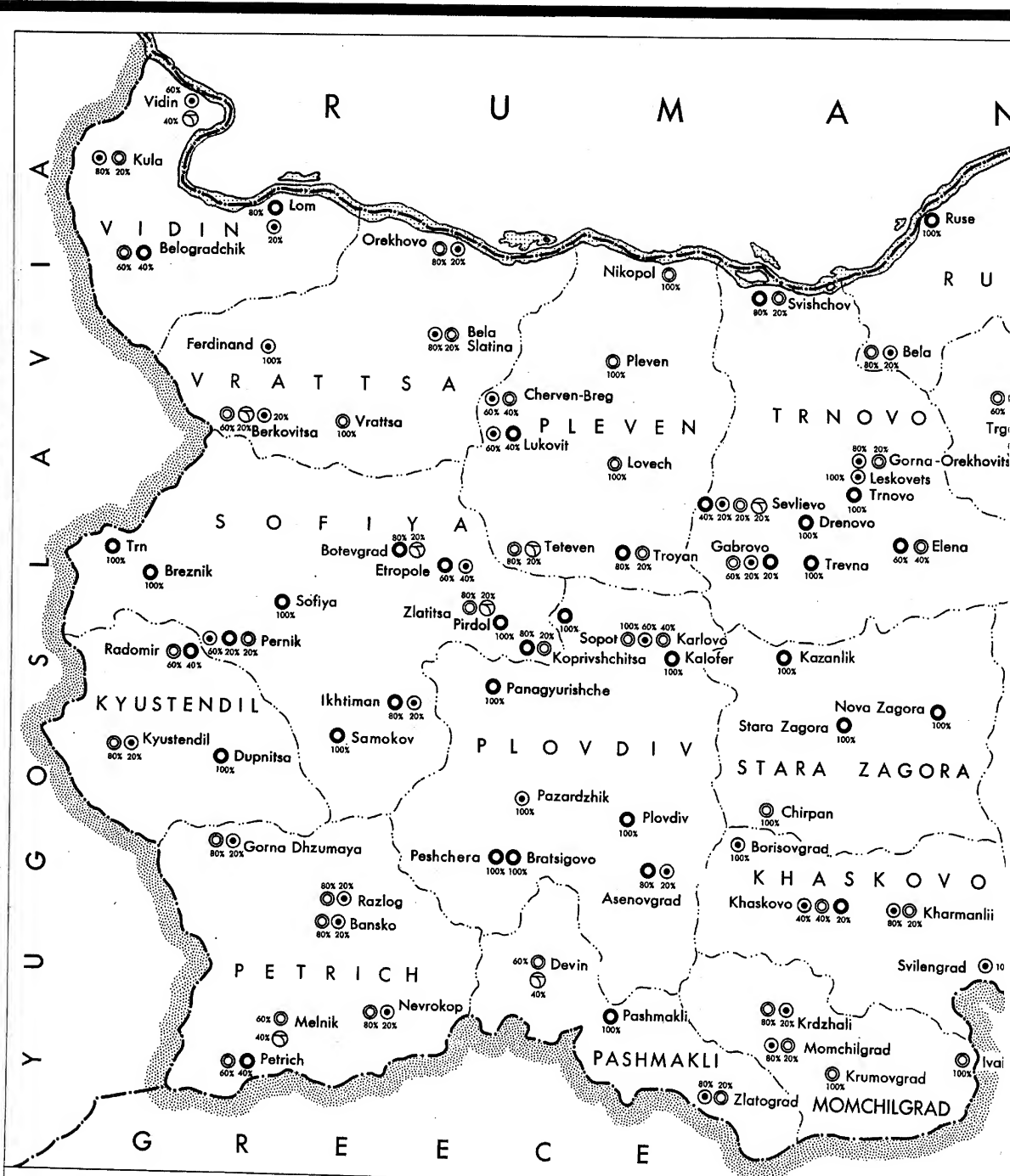
2. Maritsa Valley. The Maritsa Valley is well supplied with water from the Rodopi and Stara-Planina watersheds. The water table is often near the surface, in some places near enough to produce marshes.

3. Burgaz area. The Burgaz Plain and the Burgaska Planina, northwest of Burgaz are relatively dry as to rainfall and surface supplies of water. Springs sometimes go dry during the summer, and villages dependent on them may have to use water from distant rivers. However, there are large wells in the coastal areas near Burgaz.

TABLE VI - 33  
BULGARIA, FISHING INDUSTRY

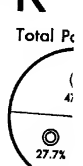
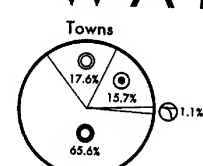
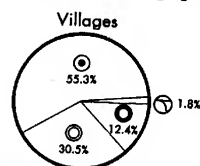
AREAS	CHIEF SPECIES	MAIN TYPES OF GEAR	FISH PRODUCTION IN METRIC TONS (1 METRIC TON—2204.6 LBS.) AVERAGE, 1925-29			REMARKS
			% OF TOTAL			
BLACK SEA COAST	Mackerel, Tuna, Horse-mackerel, Herring, Anchovy, Sturgeon, Dolphin.	Poundnets, Gillnets, Purse-seines, Trawling, Haul-seines, Line-trawl, hooks.	1,613	51.3	3,590	Varna: Mainly sedentary species; Burgaz-Tsarevo: Mainly migratory species.
COASTAL LAGOONS	Goby, Gray Mullet, Arberina, Carp, Zander.	Weirs set in channels connecting lagoons with sea; haul seines	226	7.2		
Subtotal: Black Sea Area			1,839	58.5	3,590	
DANUBE RIVER	Carp, Zander, Catfish, Sturgeon.	Haul-seines, Gillnets, set-lines.	526	16.9	971	River icebound from end of December to early March.
DANUBE OVERFLOW AREA	Carp, Pike, Catfish.	Weirs set in channels leading to river.	760	24.1		
Subtotal: Danube Area			1,286	41.0	971	
OTHER RIVERS AND STREAMS	Zander, Catfish, Carp, Cray-fish.	Weirs, Gillnets, Dipnets.	17	0.5	464	River Maritsa most important.
Grand Total			3,142	100%	5,025	

PROVISIONAL EDITION



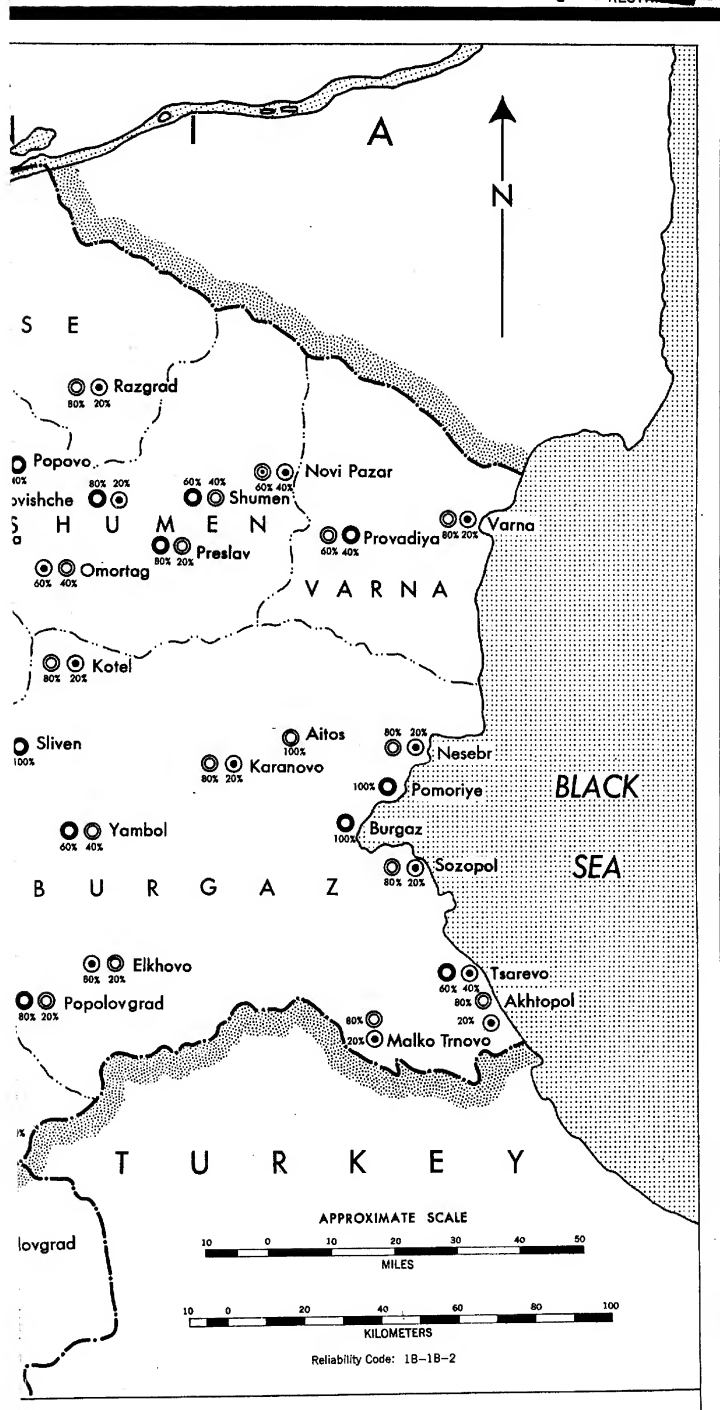
# BULGARIA : URBAN WATER

- WELLS AND SPRINGS
- WATER SUPPLIED FROM RIVERS (NO PIPES)
- WATER SUPPLIED THROUGH TILE PIPES
- WATER SUPPLIED THROUGH METAL PIPES

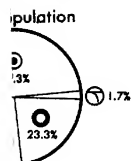


PERCENTAGE OF POPULATION USING GIVEN SUPPLY

Figure V-5  
JANIS NO. 38  
REV. 11-67



# SUPPLY, 1930



Sevlievo  
20% 20% 20% 40%  
NUMBER BELOW SYMBOL INDICATES  
PERCENTAGE OF TOWN OR VILLAGE  
POPULATION USING EACH TYPE OF  
WATER SUPPLY

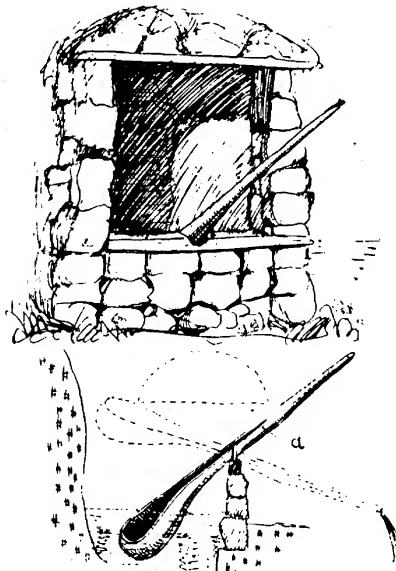
(b) *Region II.* The northern tablelands, particularly the northeastern portion (Deli-orman), is an area of acute water shortages, especially during late summer. It is composed chiefly of a type of rock into which water sinks readily. Many streams are intermittent, being dry during the hot season except for brief periods after heavy thunderstorms in late summer. During the cool season the rivers are in flood, and the flow of water is frequently violent. In general, the tablelands have only deep wells and little surface water, but there are springs and shallow wells in the valleys. Little water is obtained from wells in the thick layers of fine-grained soil which border the Danube River.

The northeastern section (Deli-orman) of the tablelands has the most critical water supply problem of all Bulgaria, chiefly as a result of the great depth of the ground water table. It is an area with approximately 240,000 inhabitants, many of whom lack sufficient water for every-day needs. Some are forced to use bottled water which has been shipped in. Public reservoirs have been built in regions of adequacy.

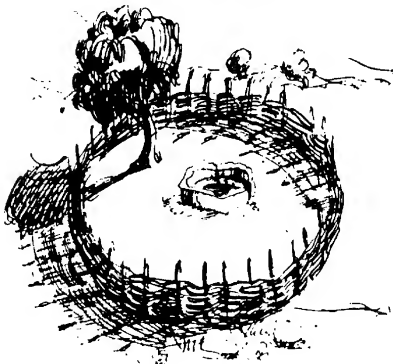
To date, 80 villages and two towns with a total population of 140,000 are thus provided for, each person receiving 70 liters of potable water per 24 hours. Many wells have been drilled to satisfy industrial requirements for water in the towns.

(2) *Water supply systems.* In 1939, 31 per cent of the total population of Bulgaria had a reasonably modern water supply, approximately 77 per cent of the urban, and 18 per cent of the rural population. (Figure VI-5.) In 1939, 43 towns (out of 97), and 453 villages and hamlets (out of 5,658) were classed as having "modern" water supply. Twenty-nine towns and 396 villages and hamlets were rated as possessing "less modern systems."

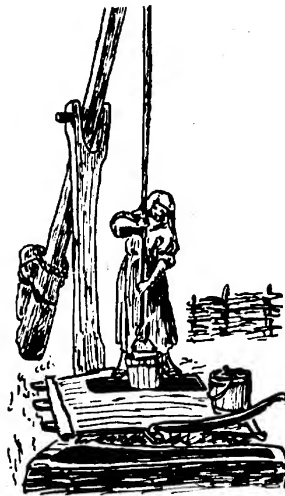
It is doubtful whether any water is chemically treated, although some may be filtered. The rural supply is generally taken from unpiped springs, wells, and streams, as shown in Illustration VI-14. In urban areas water is usually piped from communal springs, wells, fountains, and streams. Even in some larger cities water is piped only into the better hotels, apartments, and homes of the wealthy.



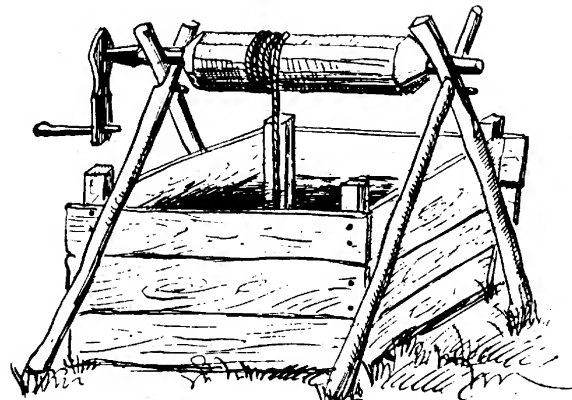
Method of obtaining water from a protected spring near Malko Trnovo.



Rural well with fence to keep animals away.



Well near Kanitz.



Well common to the Burgaz district.

Illustration VI - 14. Typical rural wells.

~~Confidential~~**B. Springs and wells.**

(1) *Ordinary springs.* Ordinary fresh-water springs occur throughout the country. However, few of them yield large amounts of water, and their flow fluctuates with the amount of precipitation. Villages which rely wholly on a spring may experience difficulty during a drought, for then water may have to be carried from a river, sometimes miles distant. These fluctuating springs are found especially in regions of volcanic rock and the sedimentary zones north of the Maritsa River.

Springs are numerous in karst regions of limestone and marble bedrock such as the northeastern plateau. Those issuing from near the surface have a temperature of 60° F.; those from greater depths are somewhat warmer, occasionally as warm as 68° F. These springs usually occur in valley bottoms or at the foot of mountains, although they may also be found on mountain sides. The water is usually hard, and is sometimes made sour by carbon dioxide. Such springs are subject to sudden changes in amount of discharge because newly-formed solution channels may reduce or stop the flow by diverting part or all of it. They also show fluctuations due to variations in precipitation. The yield of these (karst) springs may be large. Three sources in northern and seven in southern Bulgaria have a flow of as much as 1,320 gallons per second. The source of the Devna River, near Varna, has a flow of 792 gallons per second.

(2) *Thermal and mineral springs.* Bulgaria has over 900 mineral and hot springs, 44 of which are used for health resorts, with bathing or drinking. The temperature of the water varies from 68° to 182° F. The hot springs generally occur in groups and are particularly numerous on the slopes of the Stara-Planina and in southwestern Bulgaria.

(3) *Wells.* The Rodopi, Rila, and Sredna Gora Mountains, which receive heavy precipitation, supply large amounts of ground water to the surrounding areas. The water table is within 50 feet (15 m.) of the surface in the basins and valleys of the southern two-thirds of Bulgaria: 8 to 13 feet (2.5 - 4 m.) in the western Balkans basins and Maritsa lowland and 28 to 32 feet (8.5 - 9.5 m.) in the area north of Pazardzhik. In the region north of the Stara-Planina, the water table in the plateaus is very low, and wells reach water only at depths of 200 to 400 feet (61 - 122 m.). Intervening valleys have shallow wells. In the deep fine-grained soil near the Danube, well yields are small. The largest wells are in the coastland near Burgaz.

(4) *Artesian wells.* The Maritsa Valley is the only area in which conditions are favorable for artesian water. The water table occurs at 50 to 130 feet (15 - 40 m.) but there is insufficient pressure to force the water to the surface.

**C. Water quality.**

Water is of undependable quality; some may be good at the source, but is quickly contaminated in pipes and in storage receptacles. During the years 1927-9, water specimens from 596 localities were examined—97 were rated as safe; 155, including Sofiya, were rated safe by chemical analysis, but were not approved by government sanitary authorities; and 344 were rated as a menace. The fact that 499 specimens (83.3 per cent) were rated as unsatisfactory indicates that even localities with "modern water supply systems" may

have contaminated sources. Although some changes have taken place since that time, it is not believed that the general situation has altered significantly. In 1940, it was reported that all new sources of water were tested before and after tapping. Approximately 8,000 samples of water are subjected to bacteriological tests each year. Considering the whole of Bulgaria, these few tests are inadequate.

Bacillus coli is prevalent in many water supply systems. In the Sofiya district, for example, water supplies of 65 of the 144 villages and towns were found to contain B. coli.

In general water is hard, except the Sofiya supply which has a hardness rating of 32 p.p.m.\* Water hardness of other major cities is well over 170 p.p.m., while at Varna average hardness is well over 500 p.p.m.

**D. Governmental activity.**

There were no attempts at modern sanitation in Bulgaria before its liberation from Turkey. Since 1900, the Bulgarian Government has been interested in fostering water supply systems for urban areas of 6,000 population or more. The government policy of granting loans to various communes for construction of water supply systems has materially aided the country, although progress is slow due to unsettled political conditions. By 1919, Sofiya and 17 other towns had a relatively modern water supply system; by 1930, 23.3 per cent of the population had modern systems; and by 1939, 31 per cent. During the past 10 to 12 years, the government has been active in improving the quality of water through testing and control of source areas, though the number of tests made is far from adequate.

**E. Supply systems by district.**

In 1930, 47.3 per cent of the Bulgarian population depended on wells and springs for its water supply (Table VI - 34), 27.7 per cent on running water in non-metal pipes, and 23.3 percent on modern piped supplies. In recent years, about 75 per cent of new pipelines have been of iron (Table VI - 35), and from 1930 to 1939, the percentage of the population using modern piped supplies had risen by eight per cent.

TABLE VI - 34  
BULGARIA, TYPE OF WATER SUPPLY, BY PERCENTAGE OF  
POPULATION SERVED, 1930

	TOTAL POPULATION	MODERN PIPED WATER	UNDER CON- STRUC- TION	RUN- NING WATER WITHOUT METAL PIPES	WELLS, SPRINGS	RIVER
Burgaz (Burgas).....	484,028	22.0	4.4	40.4	36.4	1.2
Varna.....	230,410	36.3	1.1	37.5	26.1	1.0
Vidin.....	278,123	9.6	—	27.1	60.5	2.8
Vratsa (Vratza).....	392,410	9.9	1.7	26.5	61.8	1.8
Kyustendil.....	243,577	25.8	—	16.6	54.2	3.4
Momchilgrad (Mostanli).....	183,793	0.3	0.6	24.1	74.7	0.9
Smolyan (Pashmakli).....	68,814	6.8	—	47.4	44.7	1.1
Petrich.....	186,167	4.8	0.8	64.1	21.7	9.4
Plodiv.....	562,458	36.0	5.1	15.4	46.3	2.3
Pleven.....	431,494	10.6	5.5	44.4	42.1	2.9
Ruse (Russe).....	341,959	24.8	4.8	27.8	46.2	1.2
Sofiya (Sofia).....	642,066	53.7	1.7	14.2	30.9	1.2
Stara-Zagora.....	326,503	28.4	2.4	15.3	55.8	0.5
Trnovo (Tirnov).....	505,692	21.0	1.6	25.7	51.7	1.6
Khaskovo (Haskovo).....	245,432	3.9	3.5	19.8	75.9	0.4
Shumen.....	360,199	15.2	—	37.4	47.4	—
Kingdom.....	5,483,125	23.3	2.5	27.7	47.3	1.7

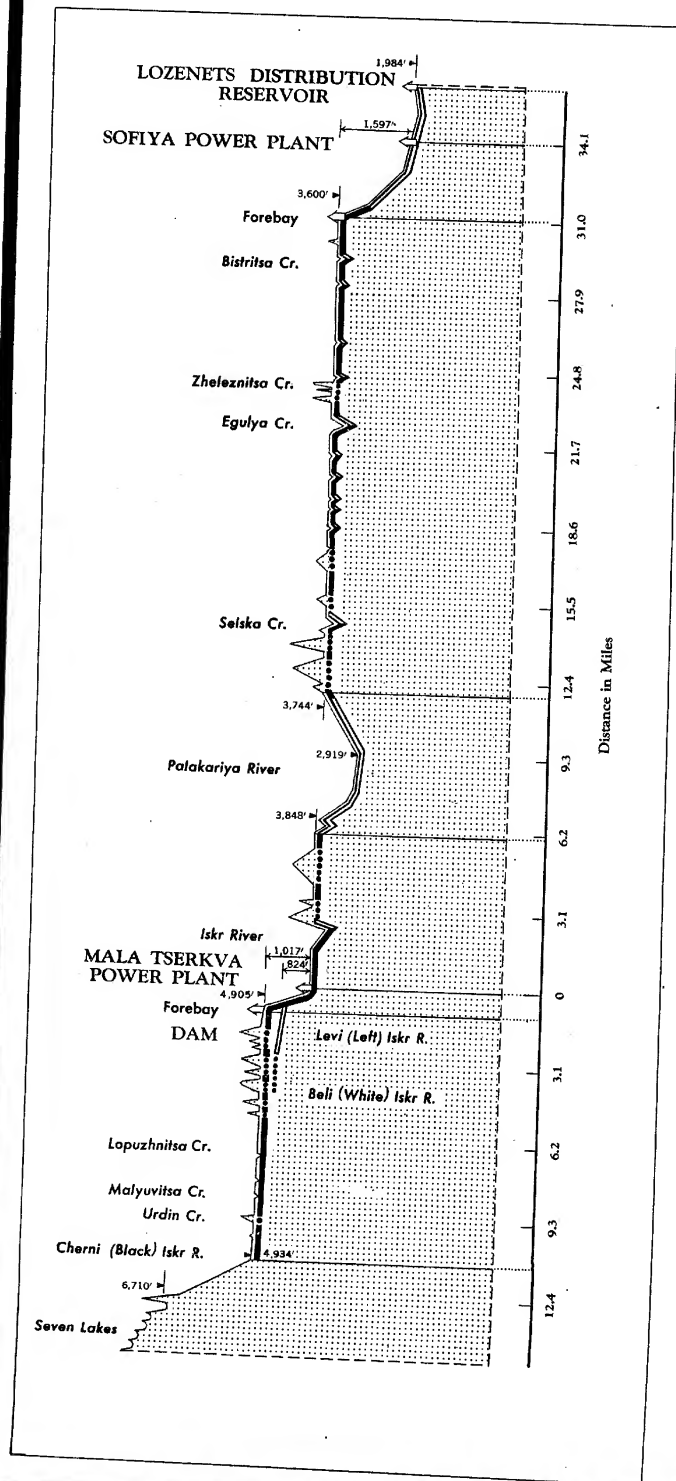
\*Hardness of about 80 p.p.m. (parts per million of mineral content) is considered the approximate upper limit of soft water.

PROVISIONAL EDITION

# SOFIYA AQUED

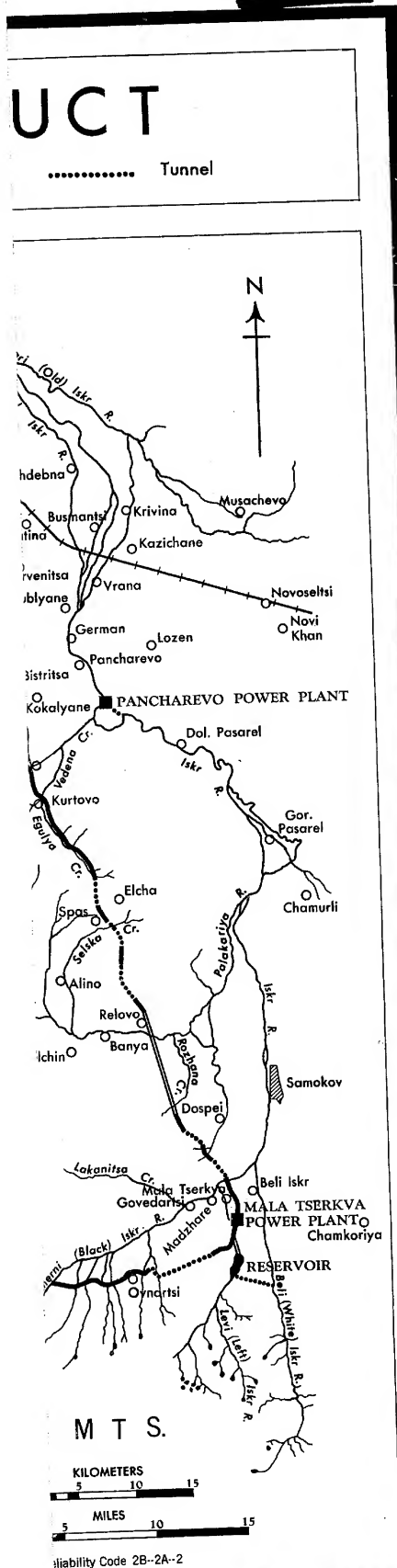
Grade Aqueduct

Pressure Pipe





CLASS NO. 38  
RESTRICTED



~~Confidential~~

TABLE VI - 35  
BULGARIA, WATER CONDUITS CONSTRUCTED BY  
REGIONAL WATER ADDUCTION SERVICES

REGION	MILES OF PIPE LAID		RESER- VOIRS	FOUNTAINS	
	IRON	TOTAL		PUBLIC	PRIVATE
Burgaz (Burgas)					
1938.....	17	23	12	109	63
1939.....	25	38	17	114	39
Vratsa (Vratza)					
1938.....	12	15	6	53	46
1939.....	25	26	12	41	93
Plovdiv					
1938.....	31	33	5	113	291
1939.....	23	27	6	104	150
Pleven					
1938.....	14	21	9	89	1
1939.....	6	11	11	36	96
Sofiya (Sofia)					
1938.....	16	28	25	165	136
1939.....	31	41	12	189	315
Stara-Zagora					
1938.....	11	19	13	9	7
1939.....	9	16	16	85	48
Shumen (Choumen)					
1938.....	9	15	9	59	13
1939.....	14	19	12	67	112
Total					
1935.....	65	84	40	189	33
1938.....	109	154	79	597	557
1939.....	133	177	86	636	853

The Sofiya district is the only one of the 16 districts of Bulgaria prior to 1934 in which the majority of the population had a modern piped supply. The leading position of the district is accounted for by the presence of the large capital city, Sofiya, which is served by a modern water system. The Momchilgrad district had the smallest percentage (0.3) of its population using modern piped supplies.

The Petrich district has the greatest percentage (64) of its population depending upon supplies of water conducted in non-metal pipes; Sofiya district places least dependence (14 per cent) on this type of supply.

The people of all districts depend heavily upon direct use of wells and springs for water, ranging from 76 per cent in Khaskovo district to 22 per cent in Petrich district. To a small degree river water is also used in all districts. The Petrich district far exceeds all others in this respect, as nine per cent of its population depends on rivers.

In 1930 almost all districts had some water works projects under construction. The Pleven district had the greatest percentage, 5.5 of its population, to be benefited by the construction of new water works systems, closely followed by the Plovdiv and Ruse districts (Table VI - 34). From 1935 to 1939 the annual mileage of pipeline construction doubled, and the rate of construction of reservoirs and fountains increased even more rapidly (Table VI - 35),

#### F. City and town water supply.

The following descriptions of supply conditions of Bul-

garian cities and towns are of varying completeness, depending on availability of sources. In some cases changes may have occurred since the date of the reference. Additional data on types of town water supply systems are given on Fig. VI - 5.

(1) *Sofiya*. The rapid growth of Sofiya, from 240,000 in 1929 to 500,000 in 1943, has taxed the water supply. It is reported that a severe drought in 1942 made it necessary to ration water.

(a) *Sources*. Water is taken from the Cherni (Black), Beli (White), and Levi (Left) Iskr Rivers in the Rila Planina (Rila Mts.) area 50 miles (80 km.) south of Sofiya (Figure VI - 6). The catchment basin covers 76.68 square miles (200 sq. km.) and has an annual precipitation ranging in different years from 39 to 79 inches (99 - 200 cm.).

A dam on the Levi Iskr furnishes the principal storage basin for the city. It is approximately 125 feet (35 m.) high and 886 feet (270 m.) long, and creates a reservoir covering 43,594 acre-feet. Water from the Beli Iskr is conducted to the reservoir by a tunnel through the ridge which separates the Levi from the Beli Iskr. Water from the Cherni Iskr is diverted directly to the Mala-Tsrkva Power Plant (Figure VI-7). Water from the reservoir is also used at the plant but under a different head.

(b) *Aqueduct*. The aqueduct is approximately 50.4 miles (84 km.) long (Figure VI - 6). It consists of 34 miles (55 km.) of grade-line concrete aqueduct (Illustrations VI - 15 and VI-16), nine miles (14 km.) of tunnels, and nine and one-half miles (15 km.) of metal pipe which are used primarily as inverted siphons to cross valleys and pass under streams. The flow of the aqueduct is 528 gallons per second. The water is utilized for power at a second time at a plant three miles (5 km.) south of Sofiya. From the power station, the water is piped to the Lozenets reservoir and then into the city mains.

(c) *Recent developments*. A few years ago a dam was started on the Beli Iskr which, when finished, would supply 30 million cubic meters per year, or a supply for 800,000 people. It was still in construction in February, 1943, but should be supplying additional water to Sofiya by 1944.

(d) *Water quality*. The Sofiya supply is noted for its remarkable softness, with a mineral content of only 32 p.p.m. The water at the source area is reputed to be clear and pure. The supply is filtered.

(e) *Alternate source*. In the event of damage to the main line, former reservoirs in the Vitosha Planina, five to ten miles (8-16 km.) south of Sofiya, could meet the minimum needs of the city.

(2) *Other towns in Sofiya district*. Table VI - 36 lists 16 towns of over 2,000 population in the Sofiya district. The table indicates general adequacy of supplies, remarkable softness of water, and a predominance of modern supply systems, although 6 of the towns are partially or wholly dependent on wells.

(3) *Burgaz*. As a result of the rapid growth of Burgaz since World War I, the water supply has long been inadequate, and at present only 11 gallons per person per day are available.

(a) *Sources*. There are two sources: the Burgaz mineral spring and the Thomas well (Figure VI - 7). The spring is located 9.3 miles (14.5 km.) northwest of Burgaz, and is the largest of a group of springs in that area. It was discovered that by sealing the smaller springs, the discharge of the larger

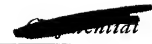
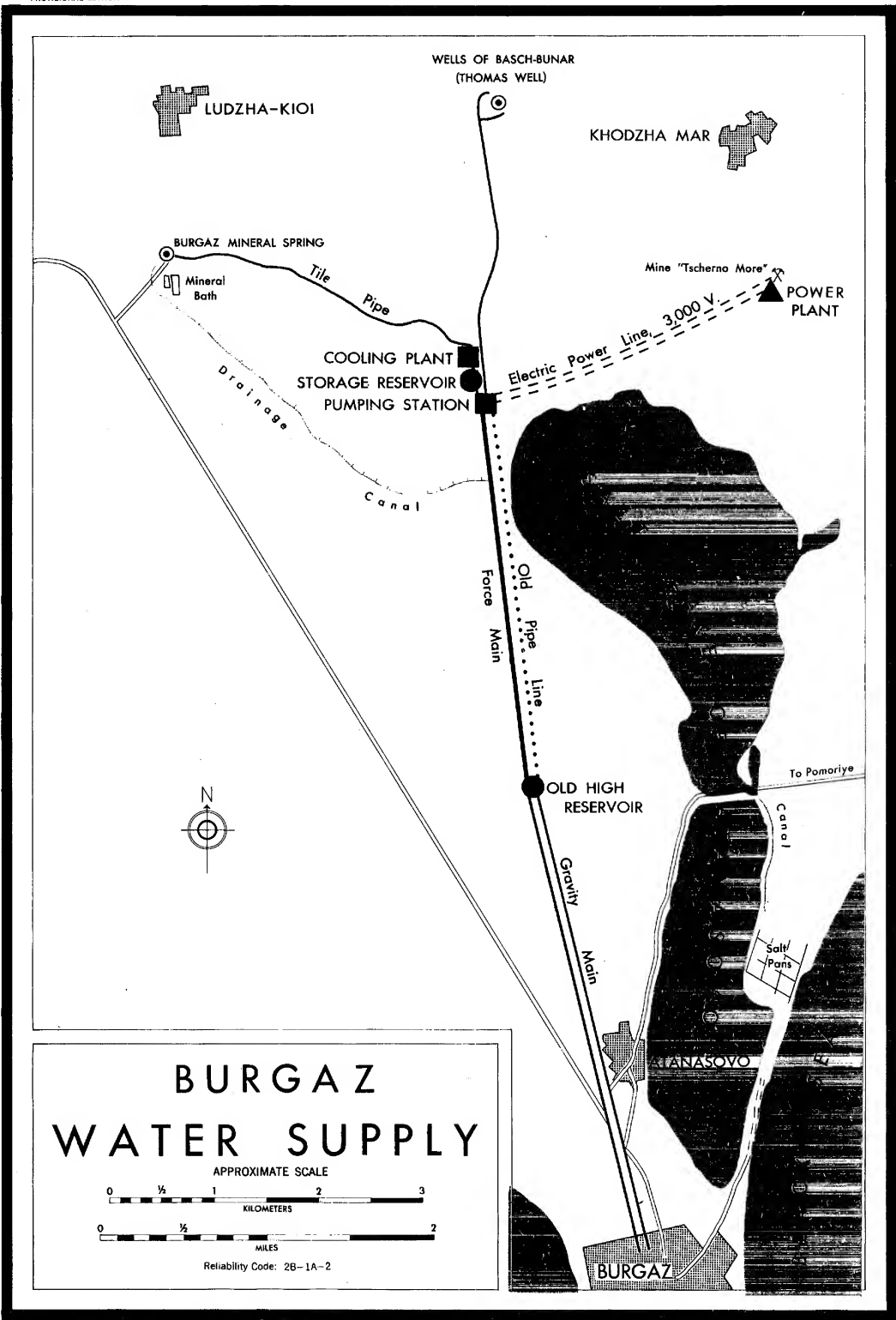


FIGURE VI - 7

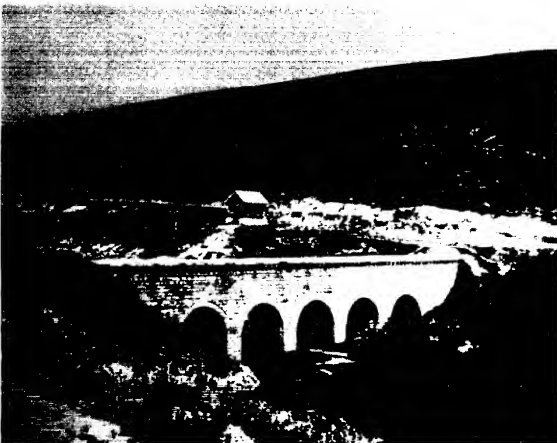


MAP NO. 2561  
AUGUST 1943

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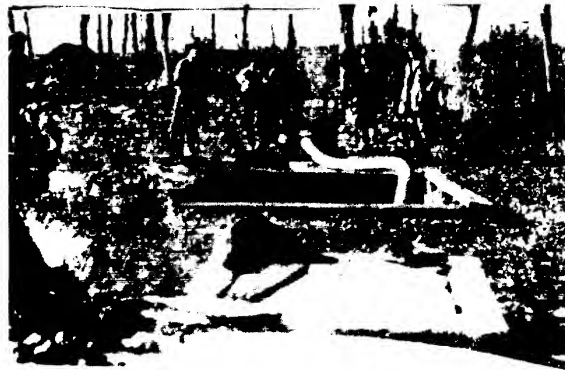


*Illustration VI - 15. Sofiya Aqueduct.*  
Aqueduct-bridge section of the 84 kilometer (50.4 miles) aqueduct from south of the city. 1940.



*Illustration VI - 16. Sofiya Aqueduct.*  
Aqueduct-bridge section over the Gegula (Egulya) River. 1940.

spring was greatly increased. The spring has been enclosed in a square concrete casing to a depth of 18 feet (5.5 m.) to prevent seepage, and is sealed at the top for additional protection (Illustration VI - 17). A working agreement between a spa and the city has been arranged. The spa receives three-fourths of the discharge during 16 hours of the day, and Burgaz receives the remaining quarter, plus the entire discharge of the remaining eight hours (night). Burgaz receives from this arrangement 376,750 gallons of water per day.



*Illustration VI - 17. Burgaz water supply.*  
Square concrete casing to prevent seepage into the thermal spring which supplies the spa and the city. 1925.

The cold-water Thomas well is located north of Burgaz, and supplies 68,480 gallons per day (Figure VI - 7).

(b) *Method of distribution.* Water from the spring is conducted by gravity in a tile pipe to a wooden drip tower over a cooling basin, and then by a cast-iron pipe to a low-level 175,000-gallon storage reservoir nearby at an elevation of 11.5 feet (3.5 m.) (Illustration VI - 18). From the low-level reservoir the water is pumped to the old high reservoir, which has its water level at an elevation of 180 feet (55 m.). Two 35-hp., two-phase electric motors pump the water through 2.92 miles (4.5 km.) of 10.93-inch (27.76 cm.) seamless steel

TABLE VI - 36  
WATER CONDITIONS IN SOFIYA DISTRICT

PLACE	POPULATION	NO. SUPPLIED DIRECTLY FROM WELLS	NO. SUPPLIED BY MODERN SUPPLY SYSTEM	LITERS REQUIRED PER DAY	LITERS AVAILABLE PER DAY	B. COLI PER LITER	HARDNESS (P.P.M.)
Aldomirovtsi.....	2,441	1,241	1,200	122,050	—	—	—
Bistritsa.....	2,845	—	2,845	142,250	864,000	20-100	32
Dolni Lozen.....	2,208	490	1,718	110,400	259,200	—	57
Dragalevtzi (Dragolerts).....	2,279	560	1,719	113,950	—	—	—
Divetino (Dwetino).....	2,003	650	1,353	75,700	—	20-100	52
Gorna Banya (Bania).....	2,312	—	2,312	115,600	129,600	—	11
Gorni Lozen.....	2,499	—	2,499	125,500	216,000	0-1000	107
Knyazhevo (Kniajevo).....	5,466	—	5,466	273,300	26,600	—	59
Krasno-selo.....	11,746	8,810	2,936	587,300	—	0-1000	14
Malashevtsi.....	4,130	—	4,130	29,250	—	—	—
Nadezhda (Nadejda).....	10,576	2,115	8,461	528,800	—	—	—
Obelya.....	2,034	2,034	—	101,700	—	20-100	147
Orlandovtsi.....	3,436	1,374	2,062	171,800	—	—	—
Pernik (Pernick).....	16,927	6,176	10,751	846,350	1,152,000	—	75
Slivnitsa.....	3,697	2,047	1,650	53,750	—	—	72
Svoje.....	2,115	529	1,586	105,750	112,320	—	57
Studena.....	2,028	200	1,828	101,400	432,000	—	41
Tsrkva (Tzerkva).....	2,024	1,278	746	71,200	—	0-1000	—
Vrazhdebna (Vrajdebna) (old).....	2,385	2,385	—	—	—	—	—



Illustration VI - 18. Burgaz water supply.  
Construction of the low-level reservoir. November 1925.

pipe to the high reservoir. Power for the pumping station is furnished by a plant at the Tscherno More Lignite Mines. It is transmitted over 2.5 miles (4 km.) of 3,000 volt line to a 50 kw. transformer at the pump station (Figure VI - 7). Disruption of power would cut off the city's water supply. At the high reservoir the spring water is mixed with the cold water from the Thomas well, and the temperature is further reduced. If desired, however, the spring water can be sent unmixed directly to the city.

Water from the Thomas well is brought down through a 5.9-inch (15 cm.) gravity line and is pumped to the high reservoir (Figure VI - 7).

(c) *Water quality.* Water from the spring has a temperature of 106° F., a weak alkaline reaction, and no odor nor unpleasant taste even when hot. It is not known whether the water is filtered or chemically treated. Hardness ranges from 71 to 246 p.p.m.

(4) *Kyustendil.* This supply is from springs in the Osogova Planina and is conducted in iron pipes under considerable pressure. There is much sub-surface water and many wells near the city, but they are not used for drinking purposes. Little water is piped into homes.

South of the town there are 40 hot springs which are joined together in one system and form the largest hot springs in Bulgaria. The discharge is 528 gallons per minute. Temperature ranges from 111° F. to 163° F. The water is used for bathing, municipal laundry, and other commercial purposes and eventually goes into the river and is used for irrigation.

(5) *Lom.* Lom is reported to have an adequate water supply.

(6) *Pazardzhik.* This city consumes 376,464 gallons daily.

(7) *Pernik.* Good water is taken from springs in the foothills of Vitosha Planina, east and southeast of town. Running water is reported in almost every house. There is hot and cold water in 13 mine-administered housing units.

(8) *Pleven.* The city has an adequate water supply system.

(9) *Plovdiv.* The water supply is taken from the mountains near Asenovgrad at a point about 12 miles (19 km.) south of the city. Poor pressure made rationing necessary during summer in 1935 and 1942. Newer portions of the city have tap water in the houses; older sections depend on fountains. Nearby areas use well water. The water table is at a depth of 13 to 28 feet (4-9 m.). Average water hardness is 171 p.p.m.

(10) *Ruse.* The city consumes 827,904 gallons daily.

(11) *Sliven.* The water supply is reported abundant and good. The installations are primitive, however, and most of the population gets its water from corner fountains supplied from a city-owned reservoir in the mountains.

(12) *Varna.* The water supply is derived from Batovo village, northeast of Varna. Water is conducted by a concrete and iron aqueduct, with a flow of 14.5 gallons per second. In 1937 new sources were being developed which would double the amount then available. Water is obtained from fountains and wells in the outskirts of the city, but it has a strong sulphurous taste. The city supply is very hard, with an average hardness of 521 p.p.m.

(13) *Vidin.* Good water is reported lacking. One of the towers of the fort is used as a reservoir for the soldiers quartered there. Daily consumption of the city is reported to be 781,440 gallons.